Engineering News

VOLUME 71 JUNE 25, 1914 NUMBER 26

Reinforced-Concrete Steamship Piers, Havana, Cuba

The Port of Havana Docks Co., which operates under a concession originally granted to Sylvester Scovel by the Government of the Republic of Cuba in 1905, has completed at Havana two very large reinforced-concrete steamship piers, which are designed to care for practically all of the export and import trade of the city. The original concession provided for the construction of four piers, but at present only two piers, together with an office and warehouse building connecting the piers at the shore end, have been erected.

Previous to the building of these piers, the handling of merchandise in the Port of Havana was almost exclusively by lighter from or to vessels at anchor in the harbor, making the total expense of handling about $3 per ton. Furthermore, this high cost was attended by utmost confusion on the landing piers. The new piers permit the berthing of any vessels entering the port with direct transport from the vessel to the wharf. At the same time, an efficient system of freight classification has been adopted, and the costs of handling the freight have been much reduced.

The two piers which have been built, called the San Francisco and the Machina piers, and noted in this article as Piers 1 and 2, respectively, are located on the west side of Havana Harbor opposite Casa Blanca. They consist of two piers, 660 and 680 ft. long, respectively, and each 164 ft. in width; the berth between them is 262 ft. 5 in. wide. Each pier is of solid reinforced concrete and carries a two-story reinforced-concrete shed which gives a dock floor and a storage floor above. The headhouse connecting the piers at their shore ends is to be five stories high.

FIG. 1. HEADHOUSES OF PIERS 1 AND 2 OF THE NEW HAVANA STEAMSHIP PIERS
(Pier 2 in the foreground; looking along marginal street toward Pier 1. View taken Jan. 2, 1914.)

The depth of water in the slip varies from 20 to 40 ft. from mean low water to soft mud, which latter is from 15 to 20 ft. deep to sand or clay. The first floor of the pier is only 5 ft. 3 in. above mean low water (Fig. 8), in order to suit the grade of a marginal street along the water front. The maximum variation of tidewater is only about 18 in., so that this low pier grade is permissible. The second floor is 29 ft. and the peak of the roof 57 ft. above mean low water, giving a height of

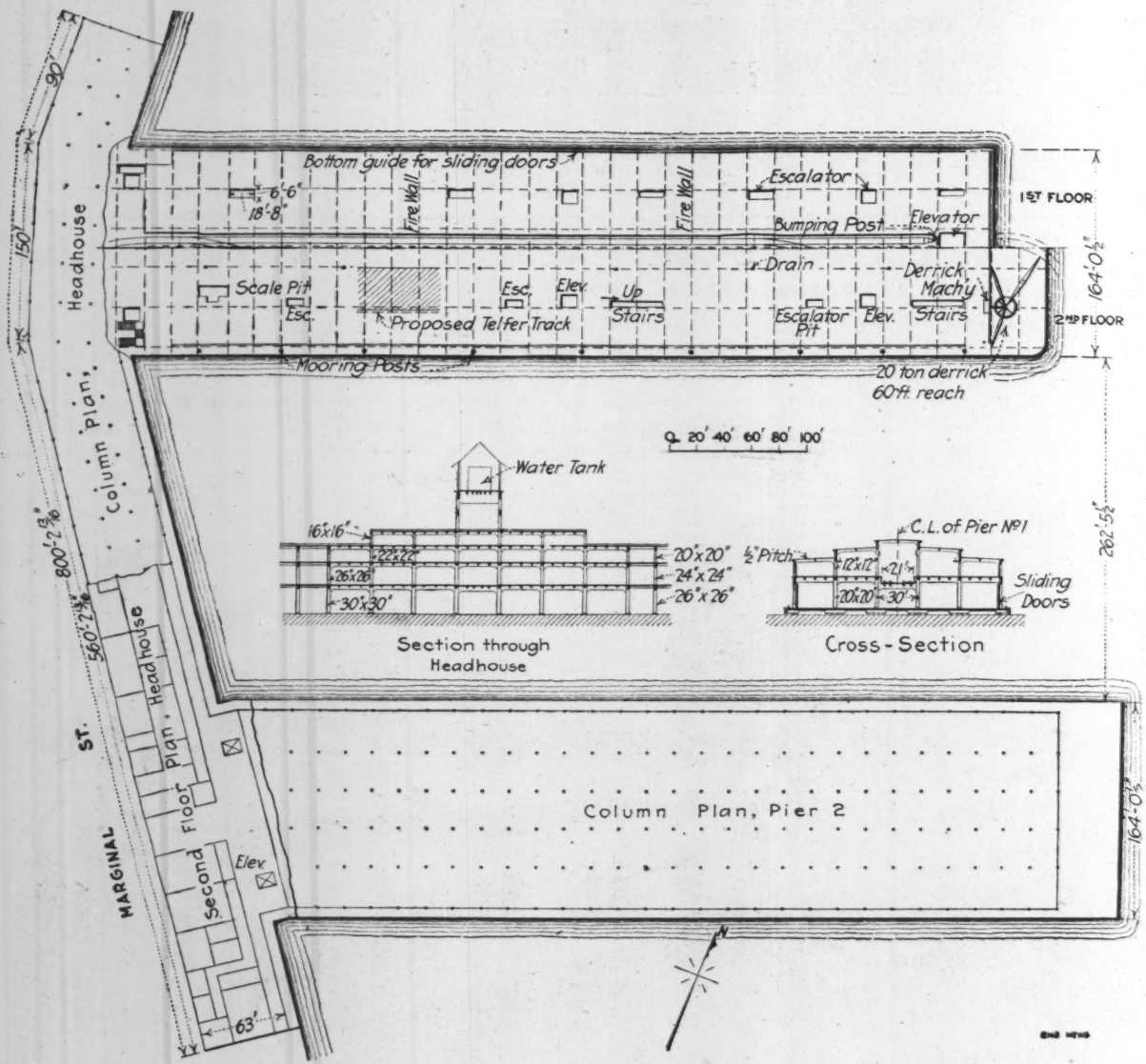

FIG. 2. LAYOUT OF PIERS 1 AND 2, HAVANA HARBOR

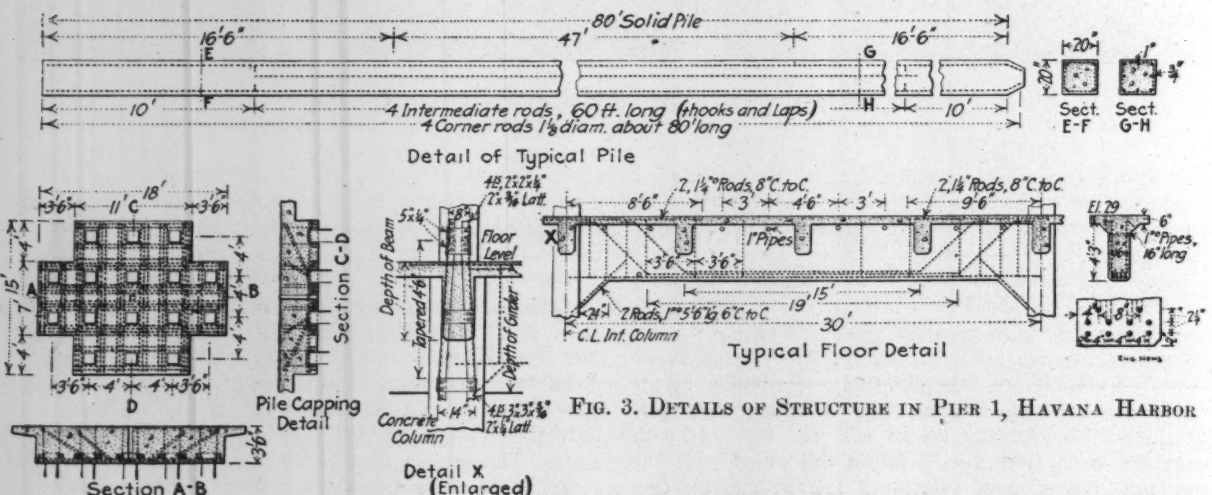

FIG. 3. DETAILS OF STRUCTURE IN PIER 1, HAVANA HARBOR

about 150 ft. maximum from base of piles to peak of roof.

The office and warehouse building, or the headhouse extending along the shore, is about 800 ft. long and 65 ft. wide. It will eventually have five stories, but is now built partly with three and partly with four stories, provision having been made in the construction for an additional story or stories. It is of brick and concrete construction, quite ornamental, as will be noted from the view in Fig. 1. It contains the offices of the Customs House, the Dock Company, and others having need for office space near the dock, and has warehouse and storage refrigerating rooms in the upper floors. The towers are occupied by water tanks for automatic sprinklers, which were installed throughout the plant.

Reinforced concrete was used throughout in the construction of the piers, for piles, floors, roof, columns, stairs, railroad pockets and exterior walls. The interior partition walls and exterior curtain wall for the office and warehouse are mostly of brick laid up in cement mortar and plastered inside and out with cement.

FIG. 4. VIEW IN PILE-CASTING YARD FOR HAVANA PIERS

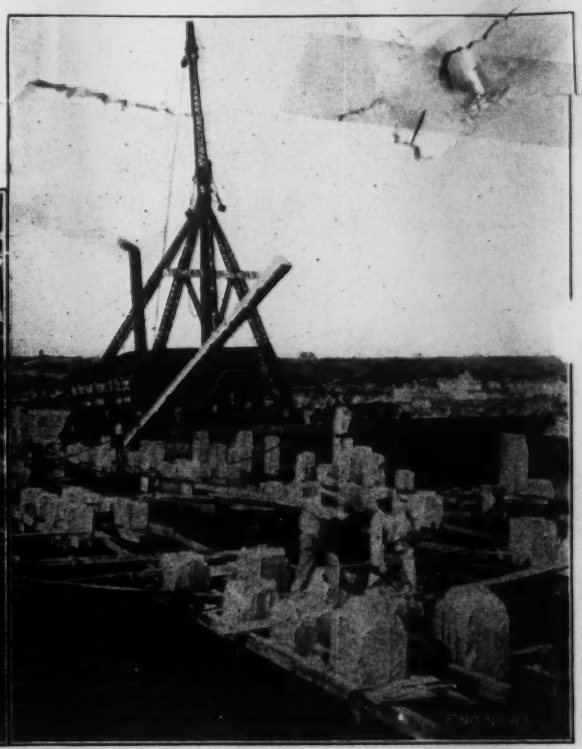

FIG. 5. CUTTING OFF TOPS OF CONCRETE PILES, HAVANA PIERS

The construction is quite simple. It consists of clusters of reinforced-concrete piles capped with heavy concrete cappings and joined with shallow and wide reinforced-concrete beams which form the basis for the concrete floor. The columns are reinforced with structural steel frames and the beams, girders and floor slabs with rods.

Reinforced-concrete piles were adopted on account of the teredo, which flourishes at its best in these waters and destroys wooden piles with great rapidity. Wooden pile clusters surrounded by concrete open cribs were first considered, but this idea was abandoned on account of the unusually great depth to hard bottom. Concrete piles were finally adopted, to be capped with rigid caps and rigidly joined together, so that the pier could be considered as a single structure with no expansion joints. Batter piles were not used to any great extent, the engineers believing that such construction was unduly expensive in proportion to the slight additional stiffness, and that straight piles answered the purpose almost as well when firmly fixed and held together at the top.

The piles used range from 45 to 85 ft. in length, the lengths varying by 5-ft. intervals between these limits. A detail of an 80-ft. pile is shown in Fig. 3. In cross-section these piles are square, measuring 16x16, 18x18 and 20x20 in., according to the length. Except in the very shortest piles, they were designed to take care of the stresses induced in handling. These stresses were figured as those resulting from hanging the piles horizontally at two points, such that the positive and negative moments became equal, and figuring them as continuous beams with overhanging ends. The suspension at these points was insured by inserting there short pieces of gas pipe, into which the handling dogs had necessarily to be placed.

The main pile reinforcement varied from ¾% to 1½%, and consisted of ¾-in. to 1⅛-in. round rods, hooped with ¼-in. square material and with a special basket reinforcement at the top to take the hammer shock. Laps of 40 diameters were made with closer spacing of the hoops at points of laps. In handling, the piles were picked up in slings, care being taken to keep a certain side, so marked, always turned up. They were then slung in the derrick, one end lowered into the water and spotted into place by the dropping. Penetrations from 10 to 20 ft. were made by the weight of the hammer only. It was found that from 200 to 1000 blows of the hammer with an average of about 500 blows, were required to complete driving. Final re-

FIG. 6. PROGRESS VIEWS OF CONSTRUCTION OF PIER 1, HAVANA HARBOR
(Date on each view; looking from marginal street toward site of Pier 2.)

final was as a rule about ⅛ in. The hammer used was a Vulcan Iron Works No. 1, 5000-lb. steam hammer, with a 42-in. stroke. Its total weight was 10,150 lb.

These piles were spaced 3-ft. 6-in. to 4-ft. centers in clusters, varying in number from 4 to 24 each. A typical cluster, with the method of design and reinforcement, is shown in Fig. 3. These clusters are bound together

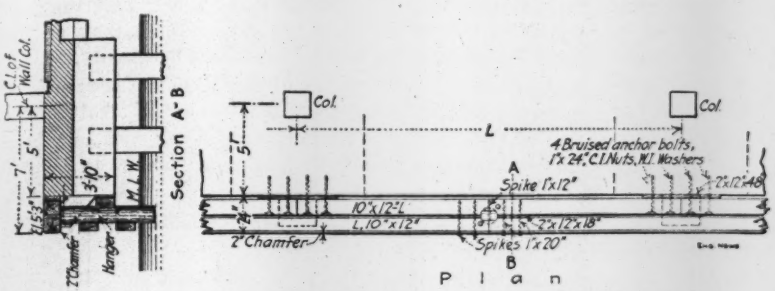

FIG. 7. DETAILS OF FLEXIBLE FENDER FOR HAVANA PIERS

by reinforced-concrete cappings 3 ft. 6 in. deep. Reinforcement of the cappings was made as though the caps were plain intersecting grillages, all plate action being disregarded. The pile loadings were about 40 tons per mile, with a full live-load from all floors above; the dead-load alone is about 15 tons per pile maximum. The high pile load of 40 tons was determined as safe by testing under an excess of that load a number of test piles driven at intervals from shore line to pierhead line.

Fender piles along the edge of the piers were considered, but were abandoned on account of the great distance to a firm bottom. A novel form of flexible or spring fender was designed, and proved very effective. A detail of it is given in Fig. 7.

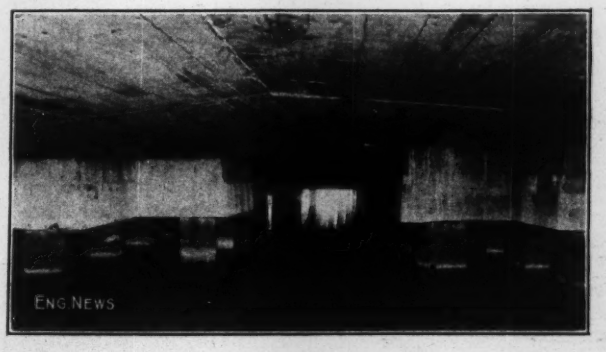

FIG. 8. UNDER THE CONCRETE DECK OF HAVANA PIERS

Details of the superstructure are given also in Fig. 3. The first floor of the superstructure, or the main deck of the pier, is designed for a live load of 250 lb. per sq.ft. The average thickness of the concrete here is 12 in. This floor is constructed of flat beams between cappings, the beams being from 15 to 18 in. thick and 7 ft. wide, with slabs spanning the space between. Columns are spaced 20 by 30 ft. in order to facilitate the movement of the trucks between.

The live load on the second floor was expected to be about 400 lb. per sq.ft. This floor, however, may safely hold nearly double that weight, and has actually held such loads. The roof is of very light design, containing only about 4 lb. of steel per sq.ft. This is permissible, because there is never any snow in Havana, and as the roof has an exceedingly flat slope, there is practically no wind pressure upon it.

Column reinforcement, which is built up of riveted structural steel to facilitate its erection and also to facilitate the holding of the girder forms, is shown in the detail in Fig. 3. This framing also permitted a simple connection of the light structural frames which were used in the roof girders and beams. This light framing was riveted to the column reinforcement before the column concrete was poured, which forwarded construction considerably.

For construction, a material and pile yard was located across the Harbor, and here were placed the necessary tracks, derricks, electric cranes and other machinery. The piles were handled by a floating derrick equipped with a steam hammer, together with a fleet of barges. This derrick is shown in some of the views. One pier was completed before work was started on the second, in order that an old passenger landing on the site of the second pier could be demolished and quarters provided for it on the first completed pier. These piers, however, were put into operation before the entire work was finished; that is to say, as soon as the lower deck was completed and wholly roofed over. The time required to complete the construction was about 40 months.

The piers were built by MacArthur, Perks & Co., Ltd., of Ottawa and New York, in accordance with the plans and under the direction of Barclay Parsons & Klapp, 60 Wall St., New York City. The plant is operated by The Port of Havana Docks Co.

A Municipal Natatorium of reinforced-concrete construction has been built for the city of San José, Calif. It is located in a public park about seven miles from the city and is reached by an electric car line. The building contains a tank 44x90 ft. in plan and 3 to 10 ft. deep. It consists of curtain walls spanning between reinforced-concrete columns, which carry a roof of reinforced-concrete arch ribs. Special features are a spring board and slide of reinforced concrete. Water is furnished from a reservoir of exceptionally pure water drawn from sources in and around the park.

The Careless Handling of Dynamite by those most familiar with its destructive effects is admitted by engineers and contractors engaged in blasting. A remarkable incident illustrating this type for foolhardiness was described in the "Travelers Standard" for May.

A certain contractor had given what he considered adequate instructions to one of his men with regard to the handling of dynamite. The work was carried on in cold weather, and the dynamite required thawing before use. The contractor had provided a suitable thawing kettle by which the thawing could be done in a safe and proper manner. A fire was built on the ground to warm the water for the kettle, and the helper was then left to attend to the purely mechanical part of the process. The contractor returned sooner than expected, and discovered that his man had stood the dynamite sticks on end in a circle around the fire to thaw, and that several of them had caught fire and were burning. He called to his helper and told him to run for his life, but the man misunderstood, and seeing that he was detected in his disregard of the instructions he had received, he immediately snatched up the dynamite that was not burning and threw it away from the fire. He then stamped upon the burning sticks, to extinguish them, and subsequently rubbed the ends of them on the hard ground, to make sure that no sparks remained. The repeated cries of warning of the contractor was interpreted by the assistant to mean simply that he should work faster. By some remarkable chance, there were no serious consequences.

Audubon Sewage-Treatment Plant

By George L. Robinson*

The sewage-disposal plant just completed at Audubon, N. J., possesses some unusual features. The borough of Audubon is a suburban community situated about twenty minutes' street-car ride south of Camden. The population is made up chiefly of business people engaged in Camden or Philadelphia. The number of inhabitants in 1910, when the plans were filed with the State Department of Health, was about 1800, but the development has been so rapid that at this writing it is about 3000.

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The sewer system covers very nearly the entire village area and is made up of approximately 42,000 ft. of 8- to 15-in. pipe sewer. One section of the village is of such an elevation that it became necessary to collect the sewage from this district and pump it to a manhole on the main line, whence it reaches the works by gravity.

As there are no factories of any kind the sewage is of a purely domestic nature. It is expected that by the end of the first year, enough connections will have been made to produce a daily flow of from 150,000 to 250,000

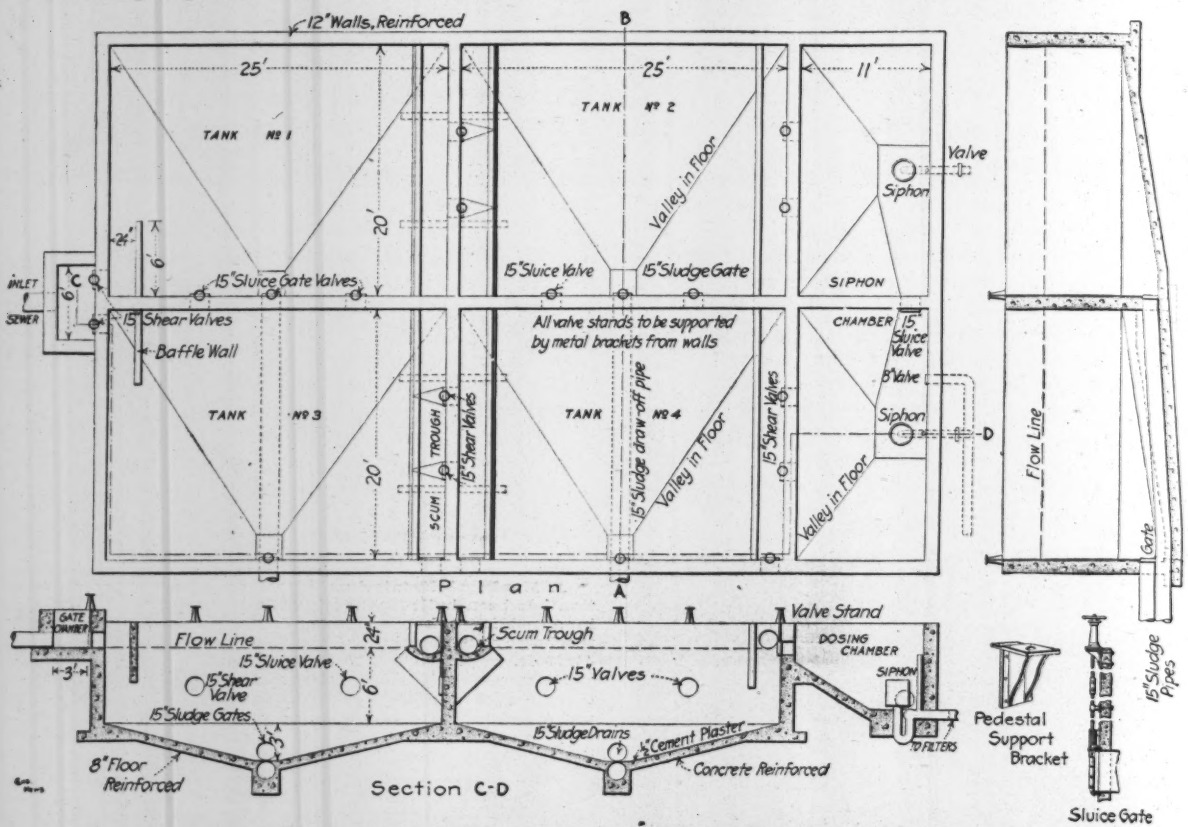
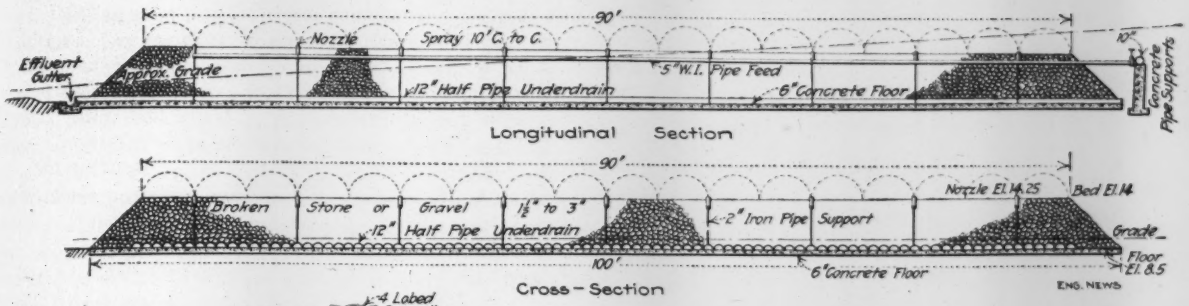


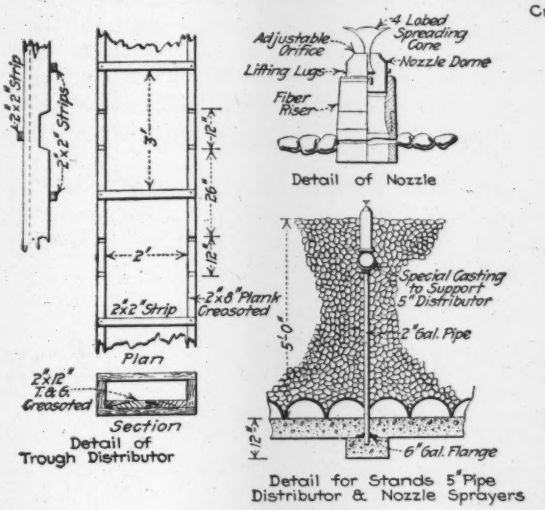
FIG. 1. SETTLING TANKS, AUDUBON SEWAGE-TREATMENT WORKS

FIG. 2. AUDUBON SEWAGE-SETTLING TANK, SHOWING VALVE STANDS AND SKIMMING WEIR

(The skimming weir and scum trough are on the near side of the longitudinal dividing wall.)

FIG. 4. UNDERDRAINAGE SYSTEM AND PIPES AND SADDLES FOR SUPPORTING DISTRIBUTING PIPES AND SPRAY NOZZLES, AUDUBON SEWAGE WORKS





gal. As much of the sewer construction was through very wet earth, there is some infiltration in spite of the fact that great care was used in laying the pipe and that underdrains were laid along most of the line.

The disposal plant is made up of (1) settling tanks; (2) siphon chambers; (3) sprinkling filter; (4) secondary sedimentation tank; and (5) sludge beds.

SETTLING TANKS—These are built of reinforced concrete with 12-in. walls and an 8-in. floor. They are four in number, each 25x25 ft. in plan (Fig. 1). The floors pitch to the sides in the form of half an inverted pyramid. The depth of sewage from the flow line is 6 to 9 ft. at the point where the sludge valves are placed. The 15-in. outfall sewer enters a gate chamber where two 15-in. shear gates control the flow in either of the first two tanks. All the tanks are connected by means of sluice gates (Figs. 1 and 2), placed in the walls half way from the bottom, so that the entire group may be operated as one unit, or each section may be cut out in turn while the sludge and mat are being drawn off to the sludge-drying beds. Tanks 1 and 2 may be run in series, or Nos. 3 and 4 in series, or the entire outfit can be run as Nos. 1, 3, 4 and 2, or in a number of other combinations. As each tank holds approximately 35,000 gal. it will be seen that the time of retention can be regulated to meet the fluctuating rate of inflowing sewage.

In each tank at one side is built a skimming weir or screen trough (see Figs. 1 and 2) for the removal of the floating mat, it being the intent to close all valves until the tank heads up 6 or 8 in. and then to sweep the mat into the skimming channel, open the sluice leading to the sludge beds and drive it off by gravity. It is thought that removal of mat and sludge at proper intervals will develop an odorless and economic operating method. It is the writer's opinion that a mat-removal device is of great value.

FIG. 3. DETAILS OF SPRINKLING FILTER FOR SEWAGE WORKS OF AUDUBON, N. J.

SIPHON CHAMBER—Across the outlet end of the settling tanks is a siphon chamber (Fig. 1), 50 ft. long by 11 ft. wide, with a pyramidal bottom to a depth of 4½ ft. for the siphon discharge. The chamber is divided into two parts by a 12-in. wall pierced by a 15-in. shear gate, so that either side or the entire chamber can be used with either of the two 8-in. Miller siphons therein contained. The siphons discharge into a 10-in. cast-iron main carrier which leads to the sprinkling filter. The elevation of the siphon invert discharge is 14.42. The surface of the broken-stone filter material is 14.00 and the nozzle dome is 14.25.

SPRINKLING FILTER—This is 100 ft. square on the bottom and 90 ft. square on the top (Fig. 3). The stone is 5 ft. deep, piled up uniformly, permitting the natural slope of the material to form the outside limit of the bed. The stone rests on a 6-in. concrete floor, laid upon a well prepared foundation. Upon this floor

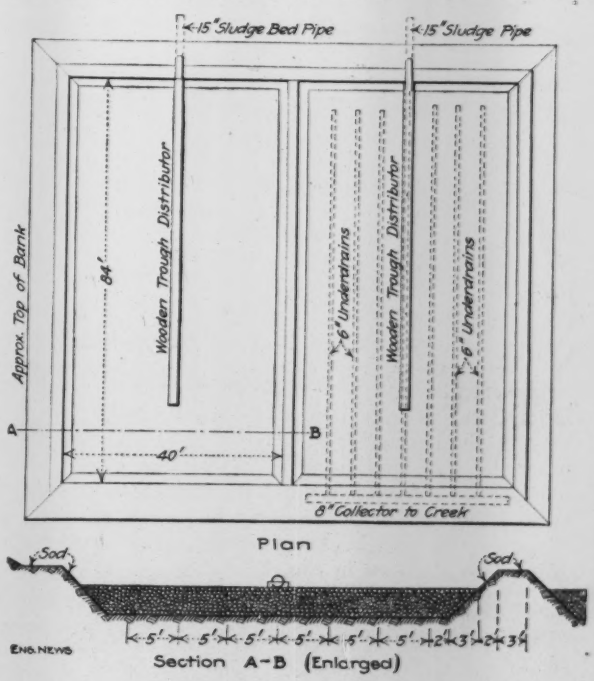


FIG. 5. SLUDGE-DRYING BEDS, SEWAGE WORKS OF AUDUBON, N. J.

are placed 12-in. terra cotta half pipe (Figs. 3 and 4), as near together as possible. These drains extend in one direction throughout the entire bed and discharge at the lower edge in a collecting trough of concrete which leads to the resettling or secondary sedimentation tank beyond. The filter stone is from 1 to 3 in. in diameter, with at least two-thirds of it of the 3-in. size.

A 10-in. cast-iron pipe extends approximately 130 ft. from the siphon chamber along the upper edge of the sprinkling bed and is carried on reinforced-concrete posts (see section, Fig. 3). There are nine 10x5-in. tees along this line, making connection to the lines of 5-in. galvanized wrought-iron pipe furnishing the distribution supply to the bed. Just outside each tee on the 5-in. lines is set a 5-in. bronze-mounted gate valve. Each line carries nine nozzles set 10 ft. c. to c., so the bed has 81 square sprays of the Taylor type, acting in 10-ft. squares. The 5-in. pipe lines are supported at the 10-ft. centers by 2-in. galvanized pipe embedded in the concrete floor of the filter bed and stiffened by means of 6-in. iron flanges. At the proper grade height, each pipe is provided with a cast-iron saddle (Figs. 3 and 4). The contact material carries the weight of the pipe in the intervals. At each point of support, a galvanized wrought-iron tee is placed, into which extends a riser to provide for the bronze distributing nozzle or sprayer (see detail in Fig. 3).

SECONDARY SEDIMENTATION BASIN—This is a concrete structure 60 ft. long, 30 ft. wide and 5 ft. deep. It provides for the settling out of humus matter which may come down from the sprinkling filter.

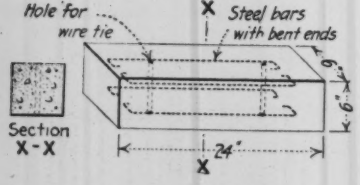
SLUDGE BEDS—These (Fig. 5) are excavated in the natural earth to a depth of 3 ft., providing embankments with a slope of 45° and a 3-ft. top between them. Each bed is 84 ft. long and 40 ft. wide on the surface. They are filled with coarse building sand with a topping of fine sand. Wooden troughs distribute the sludge. Each bed is underdrained by 6-in. unglazed field tile at intervals of 5 ft.

The plant was designed by Robinson & Wagner, Consulting Engineers, of New York, and was built under the supervision of J. J. Albertson, Borough Engineer, by the Cantrell Construction Co., of Philadelphia.

Manufacture of Concrete Block for River Protection Mattresses

BY B. OKAZAKI*

SYNOPSIS—Mattresses for river protection have been made of reinforced-concrete blocks on the Ishikari River in Japan. The work has been described by Mr. Okazaki. in ENGINEERING NEWS, *May 16, 1912, p. 922; Mar. 13, 1913, p. 512. The mattress consists of reinforced-concrete blocks of the design shown in the accompanying cut knitted together into a mat by passing wire through two holes, the blocks being set on the bank to break joints. This article describes the block plant and the various methods used in making the block. Costs are given in detail.*



Since the inauguration in 1908, of concrete-block mattress bank-protection work for the Ishikari River, many improvements have been made in the block yard installations, and several attempts to attain the highest economy in the cost of fabrication of the blocks have been pursued. The application of the bamboo stem, the employment of female labor and the investigations into the various methods of fabrication will be interesting to the expert in this branch of engineering. The block yard at Bannazuro is shown in Fig. 1.

CAST BLOCKS

The first method adopted was that of pouring semi-liquid concrete into molds. A mold capable of casting 40 blocks at a time was used. This mold is made principally of steel except the bottom platform, which is of thick wooden plank with four rectangular beams of wood dovetailed to the underside of the wooden plank, as shown in Fig. 2. There are nine partition plates of steel, 8½ ft. long, 6 in. high and ¼ in. thick, besides the side plates of the same size, thus providing ten lines of concrete blocks, there being four rows of blocks in a line. The ends of the adjacent blocks are separated by a small piece of wood block covered with sheet iron. These separators are held in place by passing a bolt through the holes previously made in them and the partition and side plates, and are fastened by the nut at the screw end of the bolt. The ends are rectangular wooden beams with inner sides lined with steel plate. These end beams are at first fixed in the right position on the bottom platform by means of screw bolts; then the said side and partition plates are put in the right position with their ends closely fitting the recesses left on the inner sides of the end beams, the separating blocks are put in, the tie bolts are passed through and the nuts at their ends are tightened. Previous to the casting of the blocks, it is better to apply an unguent on the inner sides and the bottom of the mold and it is necessary to make a device for providing the two wire holes of ⅝-in. diameter for each concrete block. This is done in two ways.

The first method is to provide hollow tubes of sheet iron as long as the width of the concrete block. Ten of these tubes are set in a line through the corresponding holes made in the partition plates, a short piece of cork of proper diameter being inserted into the ends of the adjacent tubes so as to make a water-tight joint. Such tubes are to remain in the block as they are, after the block is used for the mattress.

The second method is to use hollow bamboo stems with their nodes removed, each bamboo stem being a lit-

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tle longer than the width of the block. In this method, there is no necessity of inserting the cork for the joint of the adjacent bamboo stems, as each bamboo is simply inserted at its ends into the holes made in the partition plates. Each bamboo is previously incased or rolled in a wood shaving whose ends are pasted with rice starch; and the bamboo is easily removed by striking the narrower end of it, as one end of the bamboo is usually a little smaller than the other and the outer skin of the stem is smooth and greasy. The same bamboo stems are used over and over again, though the rolled-wood shavings, which are to be left in the concrete, must be renewed every time.

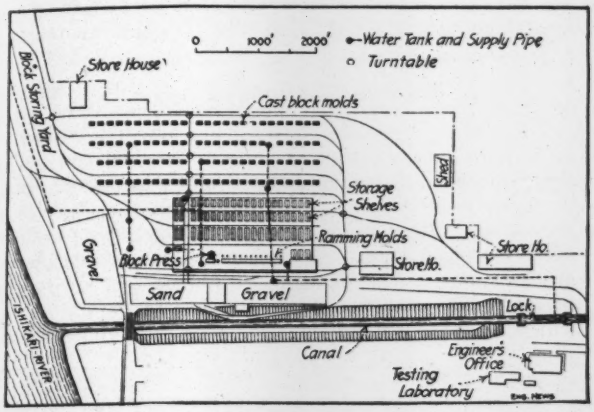


FIG. 1. LAYOUT OF CONCRETE BLOCK YARD AT BANNAZURO, JAPAN, WHERE BLOCKS FOR ISHIKARI RIVER MATTRESSES ARE MADE

The four reinforcing rods are inserted in the right position as the filling of the concrete into the mold goes on. The casting is done very easily with semi-liquid mix, the only manipulation being the repeated thrusting of a trowel along the inner sides of each compartment of the mold as the filling of the concrete goes on, in order to avoid air bubbles or voids being formed on the sides of the concrete.

As soon as a mold of 40 blocks is entirely filled up with concrete, straw mats are spread over it, the latter being kept wet constantly as long as the blocks are left in the mold. After a few days the blocks are taken out of the mold one by one by removing the side and partition plates one after another, very careful manipulation being necessary as the concrete only a few days old is not yet strong enough to allow rough handling. These concrete blocks which are thus taken out of the mold, though still weak, may be put in pile a couple of dozens for a single pile on the ground near the mold and kept wet for a few days until they become strong enough to be transported to the storing yard where the blocks are put together in a wet condition on a large pile till they are ready to be used in the mattress work.

The parts of the mold, except the bottom platform, are then well washed and recomposed for the fabrication of new blocks and so on. The greater part of the manipulation with this mold may be done by female labor.

RAMMING METHOD

For the ramming method, two types of mold are used. In the first (Fig. 3), called the "pushing-up type," and devised by K. Sakamoto, the Assistant Engineer, the concrete block together with the movable sole plate on which it rests and the movable bottom plate of the mold, on which the sole plate rests, are pushed up from below and slid out of the mold as soon as the final ramming is finished, the sides of the mold remaining stationary on the firm standard. The mold is a single box made of steel and mounted on a rigid metallic standard. The two wire holes are made by inserting metallic pins one for each hole into two holes, made in the side plates of the mold. The pins are provided with a crosshead to facilitate their handling. A sole plate, either wooden or metallic, is put directly on a movable bottom plate before the concrete is shoveled into it. The insertion of the reinforcing bars and also of the pins into the side holes is done as the ramming goes on in thin layers. The ramming is done by two laborers, each with a ram.

As soon as the ramming is finished, the movable bottom plate on which the sole plate of the concrete block rests is pushed up by the rack-and-pinion gearing worked by a steel lever arm. The concrete block together with the sole plate, is carried out to the shelves, where it is kept in moist condition.

The second ramming mold is of the side opening type, designed and supplied by a model maker. In this type, all of the side and end plates of the mold are capable of being dropped down or turned round on their hinges. This mold is simply an iron case with its four sides attached to the bottom by means of hinges. The two holes

FIG. 2. MOLD USED IN POURING BLOCKS

FIG. 3. MOLD USED IN RAMMING BLOCKS

on the side plates and the pins are provided just as in the case of the first type. The mold is put on a suitable firm stand and all of the side and end plates are raised and tightened up by means of metallic clips and binding screws so as to form a rectangular case of regular form.

No part of the manipulation allows the application of female labor with these ramming types of mold, the work being very hard.

Compression Method

In the compression method, the concrete blocks are fabricated by applying at once an immense pressure on the concrete, filled in the mold in one operation, instead of ramming in several layers. In this method, a press mold, designed by K. Sakamoto, is used. It is worked by two laborers, the pressure mounting to 45,000 lb. in all. This press mold is a massive machine, in which the pressure is applied by a combination of levers and screws. With it, the compression of the concrete loosely filled in the cradle, is 1¼ in. in the thickness of 6 in. effected by the full working of the press. After the concrete is completely pressed, the block is taken out and brought to the shelves where it is to be cured.

Some part of the manipulation may be done by female labor with this type of mold.

Consistency

Concrete of 1:3:6 mix is used. The degree of consistency or the amount of water is a problem to be solved from the results of repeated trials, particularly when special machines are applied. (1) With the casting mold, wider range in the amount of water is allowable, a semi-liquid state being rather welcome, as the complete filling and leveling of concrete can be done easily by means of common trowel so as to show neat mortar sides. The average amount of water now adopted is 1.2 cu.ft. for 1 cu.ft. of cement. (2) With the first type of ramming mold, slight excess of water tends to cause the flowing or deformation of holes in the concrete when it is pushed and slid out of the mold; on the other hand, deficiency of water may cause crumbling of concrete when it is pushed and slid out of the mold, or at least tends to rough sides. The average in this case is 0.43 cu.ft. of water for 1 cu.ft. of cement. (3) With the side-opening type, the least amount of water is used, the criterion being slight oozing out of water only after repeated hard ramming. The average in this case is 0.32 cu.ft. of water for 1 cu.ft. of cement. (4) With the press mold, more water than either of the ramming molds is used and less than with the casting mold, the criterion being slight oozing out of water on the sides of concrete after applying the compression of 45,000 lb. The average is in this case 0.59 cu.ft. of water for 1 cu.ft. of cement. A natural sand containing a slight amount of moisture is employed.

Shelves for Curing Block

The shelves where the newly made concrete blocks are to be cured are arranged in pairs of two and two under the protection of a shed. Fig. 4 shows a pair of these chambers providing four columns of shelves, each column consisting of five stories and each story accommodates space for eight blocks. The corner pillars in the figure are logs of suitable diameter with their feet set in the ground. The cross beams are attached to the pillars, on which movable rectangular stringers rest. The blocks as they just come out of the mold are at first laid on the ground while all of the stringers are taken out of place to facilitate the laying of the blocks on the ground. When the lowest or the ground row is thus filled up by eight blocks, two stringers are so put in place as to provide the second story or shelves; eight blocks are then laid on the newly made story, then the next two stringers are put in to provide the next higher story and so on. Straw mats are hung down, when the shelves are filled up, so as to retard evaporation. As soon as the blocks are cured in the shelves, for three days they are carried out of the shelves and are put on pile in the open yard, after removing the sole plates from the blocks. Here they are covered with mats and are kept in moist condition.

Fig. 4. Storage Shelves for Curing Blocks

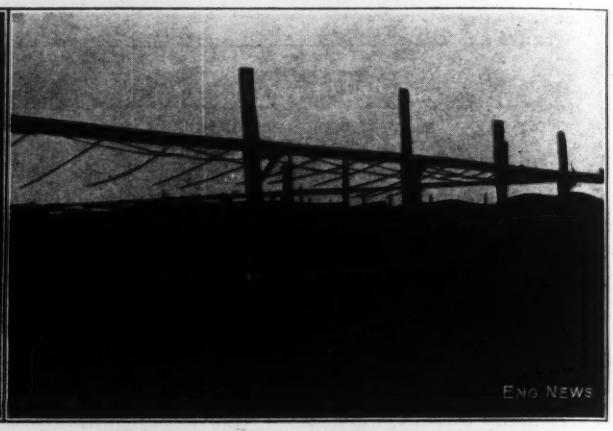


Fig. 5. Line of Bamboo Sprinklers Used in Curing Concrete Blocks in Japan

Water Sprinkler

A special sprinkler for wetting down the blocks is shown in Fig. 5. The water is supplied from a number of minute holes made in slender hollow bamboo stems with all but the lowest node septa removed. The bamboo stems are inserted in rows a few feet apart into the sides of an overhead conduit trough supplying water. By this arrangement, the drops, or rather the small

streaks of water, constantly wet the blocks set on pile under the shower and a better curing is performed than by intermittent sprinkling on the mat, as is usually done in the block yard, as the blocks are liable to overdry in the interval of consecutive sprinklings. The blocks are cured in the moist condition for at least 30 days before use in the mattress work.

Wire Straightening

The No. 12 galvanized wire used as reinforcement is sold in coils of 110 lb. The curing or straightening of coil, cutting off lengths of wire and finally bending of ends is tedious and expensive work if done by manual labor only. Consequently, there has been devised a series of automatic machines by which a coil of wire is at first stretched or straightened as soon as it is unwound from one end bit by bit then cut in lengths of 2 ft. each and finally short portions on both ends of each are bent up at right angles.

Comparison of Methods

(1) In the casting mold, 70 blocks can be made by 1 day laborer; in the ramming mold, 100 blocks can be made by 1 day laborer; in the compression mold, 139 blocks can be made by 1 day laborer. (The above does not include the labor for mixing concrete.)

(2) In the casting method, a wider range in the amount of water is allowable, than in ramming or compression method.

(3) In the casting method, damage liability of concrete blocks during the process of their fabrication and consequent handling is less than in other cases, as the blocks are left to set in the mold four days in the former case; the products are in general more uniform in the former case.

(4) Rammed or pressed blocks are more liable to be overdried during the early stage of their curing than the cast blocks, as the latter are left in the mold for at least four days.

(5) The method of making the holes in the blocks is simpler in ramming and compressing method than in the casting method.

(6) Attainment of strength is slower with the casting than with other methods.

(7) There are more troubles in decomposing, washing and recomposing with casting molds than with other molds.

(8) The first cost of the molds are as $2500, $725 and $920, respectively, for casting, ramming and pressing when 1000 blocks per day are made.

(9) Female labor may be employed to a certain extent in both casting and press molds, but not in the ramming mold.

Conclusion

The defects or demerits of the three different types of molds for concrete blocks, may be compensated for at least, to a certain extent, by the utmost care exercised during the process of fabrication and curing of the blocks. Consequently, that method that makes the cost of fabrication minimum should be best of the three methods, taking into consideration the capitalized amount for the first cost of installations necessary for fabrication.

When 100,000 blocks yearly are made at the Bannazuro plant, the costs of fabrication are, respectively, $500, $435 and $260, for casting, ramming and press mold, when interest of 5% is paid for the capitalized amount in each case. Consequently, the economy is in favor of the press mold.

Since the inauguration of this type of the bank-protection work, some years ago, the cost of its fabrication and laying has been reduced from $1.25 to about $0.83 per sq.yd., chiefly (1) on account of the improvement of the block-yard arrangement and appliance and (2) the long continued experience of the engineer and the employment of the skilled labor. Thus the cost of the concrete mattress is now rather cheaper than that of the old fashioned fascine mattress or the now prevailing log mattress. The items of the cost of fabrication of the concrete mattress may be seen by the above schedule. All of the three methods of fabrication are adopted in combination in our work.

COST OF MAKING CONCRETE BLOCKS PER 1000 (EXCLUSIVE OF LAYING THE MATTRESS)

					Remark
Cement	13.6	kegs	@ $2.093	$28.465	
Gravel	13.6	cu.yd.	@ 0.86	11.696	
Sand	6.4	cu.yd.	@ 0.116	0.742	
No. 12 galvanized steel wire	2.1	coils	@ 3.758	7.892	1 coil = 112 lb.
Straw ropes, slender	4.7	coils	@ 0.009	0.042	50 ft. long
Straw mats	26.2	sheets	@ 0.045	1.179	
Nails	0.835	lb.	@ 0.029	0.024	
Soap	5.1	sticks	@ 0.058	0.298	
Wood shavings	0.7	bundles	@ 0.040	0.028	1 bundle = 100 sheets
Bamboo stem	0.4	bundles	@ 0.210	0.084	1 bundle = 100 stems
Miscellaneous				2.351	
Coolies	44.4	men	@ 0.306	13.586	
Carpenters	2.4	men	@ 0.500	1.200	
Smith	0.3	men	@ 0.500	0.150	
				$67.737	

or 0.068 per block

COST OF LAYING CONCRETE MATTRESS PER 400 SQ.YD. (INCLUSIVE OF THE COST OF BLOCKS)

					Remark
Concrete blocks	3516.0		@ $0.068	$239.088	
No. 4 Galvanized steel wire	5.9	coils	@ 3.490	20.591	1 coil = 112 lb.
No. 15 galvanized steel wire	0.8	coils	@ 4.164	3.331	1 coil = 112 lb.
Straw ropes, slender	263.6	bundles	@ 0.01	2.636	1 bundle = 50 ft. long
Straw ropes, thick	0.7	bundles	@ 0.70	0.490	1 bundle = 720 ft. long
Logs for scaffolding	22.2		@ 0.369	8.192	
Willow fascine	314.4	bundles	@ 0.026	8.174	in bundle of 1 ft. dia. and 9 ft. long
Manila ropes	0.1	coil	@ 22.900	2.290	
Logs for piles	7.2		@ 0.196	1.411	
Miscellaneous				3.275	
Lighterage				0.332	
Transportation of blocks				3.576	
Coolies	158.1	men	@ 0.304	48.062	
Divers	0.9	men	@ 1.000	0.900	
Carpenters	4.6	men	@ 0.500	2.300	
Smith	0.1	men	@ 0.500	0.050	
				$344.698	

or $\frac{344.698}{400} = 0.83$ per sq.yd.

*

The Civil Engineers in the War Department Service—In an address at the Engineers' Society banquet at the University of Nebraska, May 9, Lieut.-Col. Herbert Deakyne, Corps of Engineers, U. S. A., said:

In the prosecution of our work we naturally have to employ a considerable force of civil engineers. We take young men from the universities and employ them first at $65 per month. After a period of service lasting say a year, they are promoted to $75, and so on according to their suitability for the work. A few years' service should carry a man to the grade of Junior Engineer with pay from $125 to $175 per month. The highest grade among the employees is Assistant Engineer, with pay from $150 to $300 per month. I should not fail to bear witness to the high character of the men to be found among the Assistant Engineers. I have the greatest admiration for their loyalty, their conscientiousness and their industry. It has been one of the pleasures of my life to work with them. Some of them spend a lifetime in the Government service. Others serve for a time and then get employment elsewhere, or go to work independently. Some of the most eminent civil engineers in this country are men who have served in their younger days in the engineer work of the War Department.

In this connection it is interesting for the "young men from the universities" to reflect that the "young men from the Military Academy at West Point" enter the service, not as workers, but as students and observers, at salaries of $141.67 per month, and in seldom less than two years become First Lieutenants at $166.67 per month.

A New Type of Spring-Rail Frog

A type of spring-rail frog which differs essentially from other frogs of this class has been designed specially for use at large railway terminals. It has the distinctive feature that the spring rail (on the turnout side) is not made from a T-rail but is a heavy flat bar sliding laterally in a slot in the side of the frog and supported by a slide plate for its entire length. The frog consists of two main parts, one of which is the spring rail, while the other is a manganese casting forming the frog point, slide plate, guide rails, base, easer rails at the toe and riser at the heel. The easers and riser lap 18 in. over the rail joints, so as to reduce pounding at the joints.

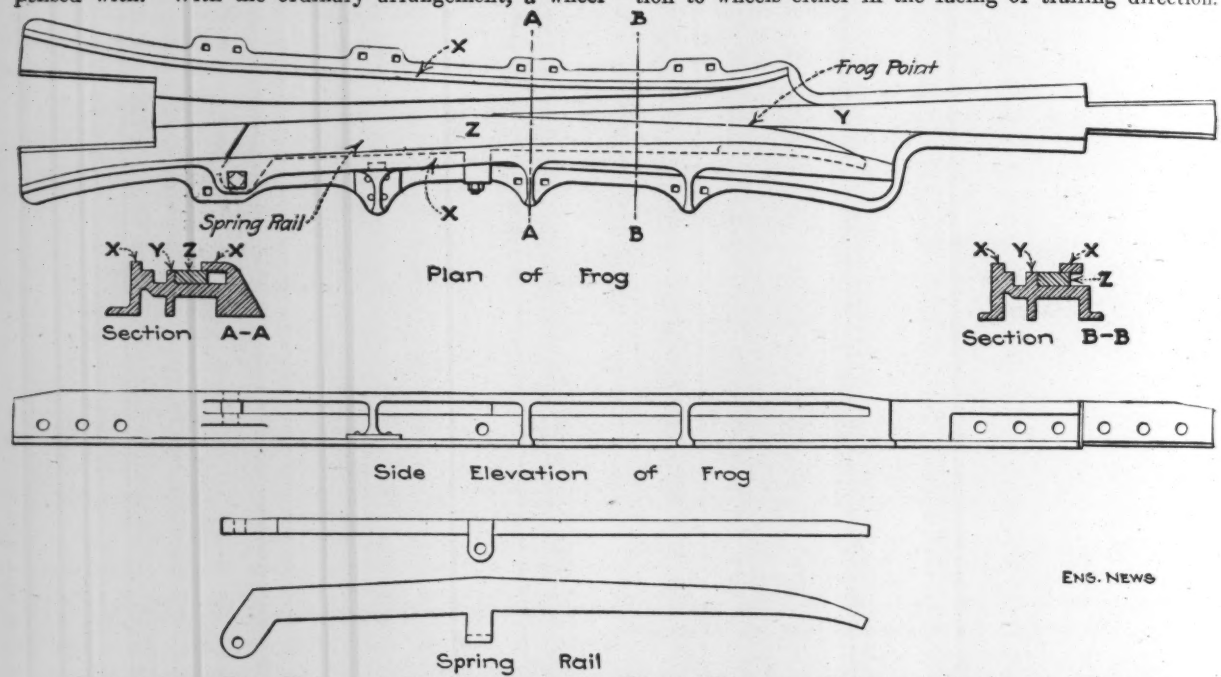
Another special feature is that the ordinary separate guard rails (laid against the outer track rails) are dispensed with. With the ordinary arrangement, a wheel passing through the frog is held in proper line by the guard rail acting upon the wheel at the other end of the axle. In the new frog, the wheel passing through the frog is held in line directly by guides on the frog itself, so that the axle and opposite wheel play no part in the guiding of the wheel. This feature is already in use in rigid frogs made by the firm which has developed the new spring-rail frog. The guide rails are made somewhat higher than the running surface of the frog and thus guide the wheel by the outer edge of the tread.

The design of the frog is such that snow and ice do not interfere with its operation, while the spring is incased beneath the frog so that it cannot be caught by dragging rods or brake beams. The guide rail on the spring side is designed to hold the spring rail so that worn or double-flanged wheels cannot throw it out of place, and if this rail should break, the frog would still be safe, as it would then act as a rigid frog. The s[illegible] are driven through flanges on the casting and thus an[illegible] the frog so that it cannot creep towards the head bl[illegible]. The spring rail itself cannot creep, as it is held in p[illegible] by the hinge pin.

The spring rail is a solid manganese-steel casting, [illegible] in., its cross-sectional area being slightly greater th[illegible] that of a 100-lb. rail. It rests on a solid base, and e[illegible] when traffic is practically all on one track it is impossible for the spring-rail side of the frog to become lower than the rigid side (as may be the case with a built-up frog where ties and track are not well maintained). No loose foot guards are required, the construction being such that men cannot get their feet caught in the frog.

As noted already, the frog has guide rails which make the ordinary guard rails unnecessary. These guides have an easy spiral at each end so as to avoid shock and vibration to wheels either in the facing or trailing direction. Wheels in good condition pass through the frog without lateral motion, while worn wheels are affected by a slight lateral movement equal to the amount or thickness worn from the flanges, which seldom reaches ¼ in. This worn wheel movement is found only where a wheel is binding the frog side of the track.

It is stated that dynamometer car records show an irregular course or path of wheels passing through the ordinary frog, due to the action of the guard rails. The truck on entering the turnout is pulled toward the inside of the curve when it strikes the bend in the guard rail, then it is pulled part way back as the opposite wheels strike the throat of the frog; when the wheel passes to the bend of the wing rail, the truck moves back to the guard rail until it passes to the last bend, when it again crowds to the outside of curve. With the new design of frog, the path of the truck is a straight line or uniform



SPRING-RAIL FROG HAVING A FLAT BAR FOR THE SPRING RAIL AND GUIDES TO DIRECT THE WHEELS THROUGH THE FROG

[Conley Frog & Switch Co., Memphis, Tenn.]

(This frog, owing to its guides, dispenses with the separate guard rails ordinarily placed opposite the frog and against the outer running rails.)

curve, as there is no guard rail opposite it to pull wheels or trucks over. It is claimed that derailments cannot occur due to loose wheels or bent axles, which sometimes cause the wheels to strike the points of ordinary frogs.

The frog is expected to prove very efficient in coach yards where long Pullman cars are handled. With the separate-guard-rail system, the force pushing cars into a siding makes a large angle with the center line of cars, and has a tendency to transfer the weight of the car to the wheels on frog side, and at the same time cause the wheels on the guard-rail side to rise slightly. Under such a condition, the wheel may mount the guard rail and allow the opposite wheel to take the wrong side of the frog point. With the new frog, the wheels are positively guided by the frog itself, and do not depend on their mates (held by outer guard rails) to pull them to the proper side of the frog points.

The spring-rail frog described above is one of the recent specialties of the Conley Frog & Switch Co., of Memphis, Tenn., and we are indebted to the makers for plans and other information.

A Proportional-Flow Weir

By E. W. Rettger*

SYNOPSIS—The author finds that a weir whose width at any point is inversely proportional to the square root of the height of that point above the crest will have a theoretical discharge exactly proportional to the head. As the weir coefficient (actual divided by theoretical discharge) is likely to have different values for different heads, the theoretical shape must be modified slightly in order that the actual discharge shall be directly proportional to the head. The author gives a process for making this adjustment.

A weir of such shape that the *flow is directly proportional to the head* would offer several decided advantages over other weirs, especially in boiler-feed regulation. The Department of Experimental Hydraulics in Cornell University had occasion recently to look up several references to such a weir. In none of these articles was the shape given, or the mathematical theory underlying such a weir indicated, or any references given to any article where this weir was discussed in detail.

I propose to do two things in this article:

(1) To develop the shape of a weir for which the *theoretical* flow is directly proportional to the head.

(2) Since (probably) the coefficient is a variable quantity, to develop a general method by which a weir may be so changed (slightly) as to have a constant, or in the present case make the *actual* discharge directly proportional to the head.

The Theoretical Weir of Proportional Flow

Suppose Fig. 1 represents the weir. Let MN be a narrow strip at a distance $h - x$ from the top (water surface) and of area $dF = 2z\,dx$. The theoretical velocity of outflow at this height is

$$v = \sqrt{2g\,(h - x)}$$

The theoretical discharge through this narrow strip is therefore

$$dQ_1 = v\,dF = \sqrt{2g\,(h - x)}\;2z\,dx$$

For the theoretical discharge Q_1 through the entire weir, therefore, we have

$$Q_1 = \int_o^h v\,dF = 2\sqrt{2g}\int_o^h (h - x)^{\frac{1}{2}}\,z\,dx$$

We wish now to so proportion the width for different heights that this discharge Q_1 is directly proportional to h. This integral is to be of the first degree in h. The quantity to be integrated must, therefore, be of one degree lower in x. Let us suppose that

$$z = \frac{b}{2\,x^{\frac{1}{2}}}$$

where b is a constant. Then

$$Q_1 = \sqrt{2g}\,b\int_o^h \frac{(h - x)^{\frac{1}{2}}}{x^{\frac{1}{2}}}dx = \sqrt{2g}\,b\int_o^h \frac{h - x}{(hx - x^2)^{\frac{1}{2}}}dx$$

$$= \sqrt{2g}\,b\left[\int_o^h \frac{h\,dx}{(hx - x^2)^{\frac{1}{2}}} - \int_o^h \frac{x\,dx}{(hx - x^2)^{\frac{1}{2}}}\right]$$

These integrals belong to simple standard types and can be evaluated by reference to a table of integrals. Doing this we have

$$Q_1 = \tfrac{1}{2}\sqrt{2g}\,b\,\pi\,h$$

which answers the requirements of the problem. Therefore, when the sides follow the law expressed by the equation

$$2\,z\,x^{\frac{1}{2}} = b$$

the theoretical discharge is directly proportional to the head h. This curve (see Fig. 1) is asymptotic to the axis Z (the level weir crest), and also to axis X. If $x = 1$ then $b = 2z$. Consequently, b = width of weir at unit distance from base. In any particular case the selection of this width will be controlled by the range of discharges involved.

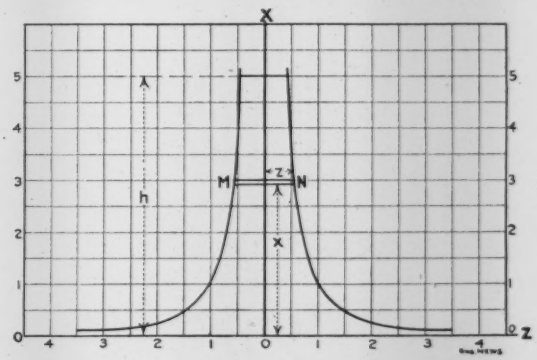


Fig. 1. The Proportional-Flow Weir

Modifying the Weir Form for Constant Coefficient

For the actual discharge we have

$$Q = C\,Q_1$$

where C is an experimentally determined function of h.

*Assistant Professor of Applied Mechanics, Cornell University, Ithaca, N. Y.

We will now show how this theoretical weir may be changed (slightly) so as to take into consideration the variation in C, and thus make the *actual* discharge directly proportional to the height h. Since in the case of the weir in question the law for C is not known, we will show the method for the case of the 90° notch, for which precise experimental data are available.

Fig. 2 represents a 90° notch. The formula for the theoretical flow Q_1 in this case has the same form as before, or

$$Q_1 = \int_o^h \sqrt{2g}\,(h-x)^{\frac{1}{2}}\,2z\,dx$$

Now $z = x$ for a 90° notch. Therefore,

$$Q_1 = \int^h 2\sqrt{2g}\,(h-x)^{\frac{1}{2}}\,x\,dx$$

This integral belongs to a simple standard type, and can be evaluated by reference to a table of integrals. Doing this we have,

$$Q_1 = 2\sqrt{2g}\,\tfrac{4}{15}\,h^{\frac{5}{2}} = a h^{\frac{5}{2}}$$

If the foot and second be used as units then $a = 4.28$ and therefore for the actual discharge Q we have

$$Q = C\,Q_1 = 4.28\,C\,h^{\frac{5}{2}}$$

T. P. Strickland (*London Engineering*, Oct. 28, 1910) gives as the actual discharge for a 90° notch (based upon the experiments of James Barr)

$$Q = \left(0.2907 + \frac{0.028}{\sqrt{h}}\right) h^{\frac{5}{2}}$$

In this Q is given in cubic feet per minute, and h in inches. If we change the units so that Q is given in cubic feet per second and h in feet, then

$$Q = \left(2.417 + \frac{0.067}{\sqrt{h}}\right) h^{\frac{5}{2}} = 2.417\left(1 + \frac{0.0277}{\sqrt{h}}\right) h^{\frac{5}{2}}$$

Now $Q = C\,Q_1$ or, since $Q_1 = a h^{\frac{5}{2}} = 4.28\,h^{\frac{5}{2}}$

$$2.417\left(1 + \frac{0.0277}{\sqrt{h}}\right) h^{\frac{5}{2}} = 4.28\,C h^{\frac{5}{2}}$$

Therefore, solving for C,

$$C = 0.565\left(1 + \frac{0.0277}{\sqrt{h}}\right) = u\left(1 + \frac{0.0277}{\sqrt{h}}\right)$$

where u is really a constant, and in the case of the 90° weir $u = 0.565$.

We wish now to determine the shape of the sides of the weir so that the *actual* discharge is

$$Q' = u\,a\,h^{\frac{5}{2}}$$

where u is a constant in all cases. We will assume that C does not appreciably change for a *slight* change in the shape of the weir; that is, we will assume that C times the new theoretical discharge is equal to the actual discharge. This appears to be in accord with experimental evidence. The problem may now be stated as follows. We wish to change z (the half width at distance x above the vertex) so that the new z, say z_1, is such a function of x that C times the new theoretical discharge $Q_2 = u$ times the old theoretical discharge Q_1, or,

$$Q' = C\,Q_2 = u\,Q_2 = u\,a\,h^{\frac{5}{2}}$$

Let $z = z + \Delta z$; then equation (3) may be written,

$$C\int_o^h 2\sqrt{2g}\,(h-x)^{\frac{1}{2}}(z + \Delta z)\,dx = u a h^{\frac{5}{2}}$$

Dividing through by C and breaking up the integral into two integrals, we have, since $C = u\left(1 + \frac{0.0277}{\sqrt{h}}\right)$

$$\int_o^h 2\sqrt{2g}\,(h-x)^{\frac{1}{2}}\,z\,dx + \int_o^h 2\sqrt{2g}\,(h-x)^{\frac{1}{2}}\,\Delta z\,dx$$

$$= a h^{\frac{5}{2}}\left(\frac{1}{1 + \frac{0.0277}{\sqrt{h}}}\right) = a h^{\frac{5}{2}}\left(1 - \frac{0.0277}{\sqrt{h}} + \textit{higher powers}\right)$$

$$= a h^{\frac{5}{2}} - 0.0277\,a h^2 + \ldots.$$

Now the first integral is $Q_1 = a h^{\frac{5}{2}}$. Therefore,

$$\int_o^h 2\sqrt{2g}\,(h-x)^{\frac{1}{2}}\,\Delta z\,dx = -0.0277\,a h^2$$

Since the integral is of the second degree in h, the quantity under the integral sign must be of the first degree in x. Suppose

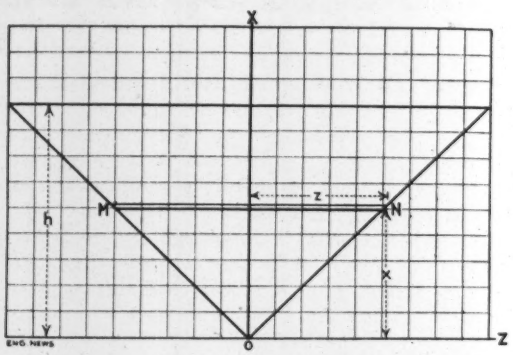


FIG. 2. THE 90° WEIR; ADJUSTING FOR CONSTANT COEFFICIENT

$$\Delta z = k\,x^{\frac{1}{2}}$$

where k is a constant to be determined. Therefore, since $(h-x)^{\frac{1}{2}}\,x^{\frac{1}{2}} = (hx - x^2)^{\frac{1}{2}}$,

$$2\sqrt{2g}\,k\int_o^h (hx - x^2)^{\frac{1}{2}}\,dx = -0.0277\,a h^2$$

The integral belongs to a simple standard type. Integrating we have

$$2\sqrt{2g}\,k\pi\frac{h^2}{8} = -0.0277\,a h^2$$

where $a = 4.28$.

Solving for k we have

$$k = -0.0188$$

and therefore for the z of the new weir we have

$$z = x - 0.0188\,x^{\frac{1}{2}}$$

The *actual* discharge through the new weir is then

$$Q' = u\,Q_1 = 0.565 \times 4.28\,h^{\frac{5}{2}} = 2.42\,h^{\frac{5}{2}}$$

where Q' is in cubic feet per second and h is in feet.

It must be remembered that the variation in the shape must be small so that C approximately holds for the new weir as well as for the old. We also assumed that the powers of $\frac{0.0277}{\sqrt{h}}$ above the first could be neglected. If for any reason it is desirable to add (say) one more term to the expansion in equation (4), we would assume

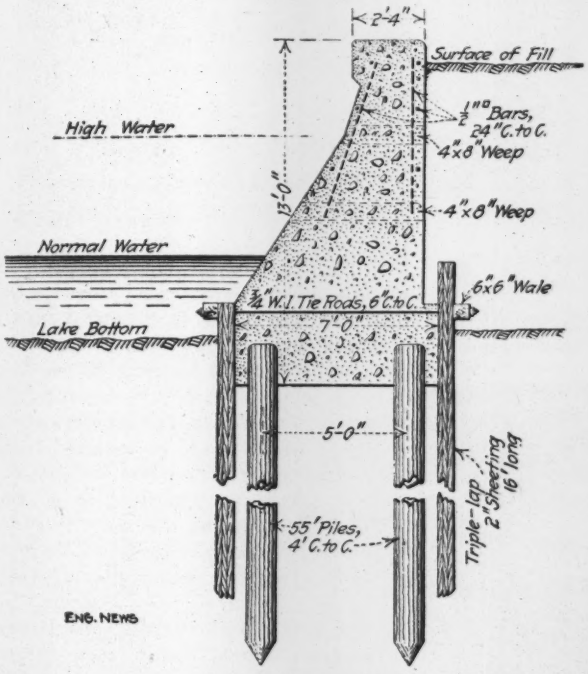
$$z = z + \Delta z + \Delta^2 z$$

To determine $\Delta^2 z$ we would equate it to the third term in the right-hand side and proceed as we did for Δz above.

Pile and Concrete Sea Wall for Land Reclamation at New Orleans*

The city of New Orleans is making about 27 acres of new land at the "West End" for municipal purposes. The work comprises the construction of a pile and concrete sea wall on Lake Ponchartrain, about 2650 ft. long, and the dredging and depositing of a fill averaging 8 to 12 ft. deep behind this wall. This dredging, amounting to about 400,000 cu.yd., was done in the lake by means of a hydraulic dredge and cost 11.37c. per cu.yd., placed in fill.

Before placing the fill, the sea wall was built around the entire inclosure. The wall is of concrete, placed on



SECTION THROUGH SEA WALL AT NEW ORLEANS, LA.

a double row of 50-ft. oak piles spaced 5 ft. c. to c. each way. In front of this piling a triple row of sheet piling was driven as a coffer-dam and to prevent the fill sliding back in the lake. About 3 ft. of material was excavated for the base of the concrete cap, so that the piles are entirely protected from the action of the teredo. The wall is provided with two rows of weep holes, and has expansion joints 50 ft. apart.

Including the piles, excavation and concrete, the wall has cost about $26 per lin.ft., or $13 per cu.yd. of concrete. The labor costs were $1.75 to $2 for common labor and $3 per day for skilled labor. Gravel was used for the concrete aggregate. The cost of construction was increased on acount of the necessity of placing the mixer at one end of the work and the concrete and other material then hauled over a long trestle to the point of deposit.

*From the report of a commission of the Sanitary District of Chicago, which recently visited the Panama Canal and other engineering works. The work described was under the direction of W. J. Hardee, City Engineer of New Orleans.—Ed. "Eng. News."

The Potential Value of Our Engineering Graduates*

Unfortunately, it is difficult to show in any concise and, at the same time, fairly representative manner, exactly what return our engineering colleges are making to the community and to the nation for the capital which is being invested in them. Perhaps the most definite, though quite incomplete analysis of the question, may be given in the following manner:

The unskilled workman earns annually, on the average, about	$500.00
The nontechnical but trade-trained man earns annually, on the average, about	800.00
The technically-trained graduate of our engineering colleges earns annually, on the average, at least	3,000.00
This is a gain over the trade-trained man, per year, of at least	2,200.00
This may properly be credited to the result of his engineering training; and, assuming that the demand for his services fixes his rate of compensation as a measure of his money value to society, this means that, capitalized at 4%, he has an increased potential value to the community of	55,000.00

This analysis is admittedly incomplete, as it includes no consideration of the many ways in which the graduates of our engineering colleges are of increased value to society, aside from their purely professional ability, for which they receive the income forming the basis of this analysis. Their training in exact methods of study and investigation of any problem with which they may be confronted makes them of value in any connection they are likely to form.

At the present time there are over 25,000 students registered in the three principal departments of our engineering colleges—civil, mechanical and electrical engineering, and these three engineering departments are graduating annually over 4000 men to take up their lifework along lines for which their college experience has given them direct training.

It is possibly somewhat startling to realize that merely from the purely financial basis of increased potential value of these men, through their ability to secure increased incomes, this represents a valuation of the annual product of these three departments of our engineering colleges of at least $220,000,000. In electrical engineering alone, there are living in the United States today about 20,000 men, who have received their training and have graduated at our engineering colleges, which, upon the basis already stated, represents a valuation of this one product of our engineering colleges of over $1,000,000,000.

Spreading Sound Ideas on Highway Improvement—Sanity has overtaken the advocates of better rural highways. In the old days the good roads advocate dreamed of nothing less than macadam, and his visionings ran oftener to brick-paved paths and concrete country lanes. All the rural world rolled smoothly by over traffic ways that would cost anywhere from $5000 to $15,000 per mile. That was before the farmer had really entered into the movement and before the small town merchant, the rural banker and the county-seat cities had begun to think about good roads in terms of dollars and cents. Twenty years of agitation has brought us face to face with the fact that the taxpayer does not want speedways, joy-rider trails or roads for pleasure traffic. The man on the farm wants a firm, well-drained highway that he can use at any and all seasons of the year, and he does not want to be bankrupted or driven to the poorhouse in getting it.—Editorial from the St. Louis, Mo., "Republic."

*Extract from an address by Prof. Harold B. Smith, Worcester Polytechnic Institute, at Clarkson College of Technology, Potsdam, N. Y.

Special Concrete Piling for a Viaduct Foundation

By John Stewart*

A type of reinforced-concrete pile, in which a precast pile is grouted into the hole made by a previously driven shell, was described in Engineering News, June 11, 1914. Below is given a more complete description of the application of that pile to the foundations of a viaduct for the Lake Erie & Eastern R.R., an extension of the Pittsburgh & Lake Erie R.R., at Crossing No. 1, Youngstown, Ohio.

Crossing No. 1 designates the first crossing of the Mahoning River by the new line and the site of the work was on the banks of this river. The soil consisted of from 8 to 10 ft. of cinder and slag fill, 8 to 10 ft. of black slippery mud or silt to loose gravel about 20 ft. below surface, and compact sand and gravel 25 to 30 ft. below the surface. The uncertain part of this soil condition was the black mud or silt, which was very soft and wet and, being confined between two hard layers, acted as quicksand when excavation was made through it. While the top soil is classed as cinder fill, it was mill cinders and contained considerable slag. This material was in layers and lumps, and had set and formed quite a hard mass to penetrate. Since this material was near the top of the site, a pile of the tapered type would have been held in it before proper bearing was reached in driving, which would have resulted in an uncertain foundation as the site is subject to flood disturbance, owing to the soft silt between the hard layers.

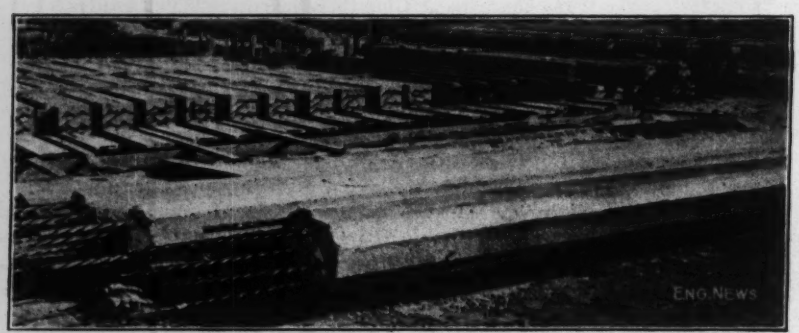


Fig. 1. Precast Cores for Concrete Piles, in the Molding Yard

Taking into consideration the peculiar soil conditions, the possible flood disturbance, and the heavy loads to be sustained, it was desirable to obtain a pile which would penetrate the top 8 or 10 ft. of fairly compact material through the soft muck and obtain a firm bearing well into the sand and gravel 20 to 30 ft. below the surface; also a pile that would act as a column with a constant cross-section throughout with sufficient reinforcement to take care of lateral strains which might occur on account of the inequalities of the soil.

The railroad company adopted Simplex Molded Inserted Concrete Piling for these foundations. For this construction the holes for the piles were prepared by driving standard 16-in. Simplex pile forms, using cast-iron points. After the pile form had been driven to proper penetration, which was ½ in. or less under the blow of a 3000-lb. drop hammer falling 15 ft., from to 5 ft. of wet concrete was placed inside the form. The reinforced cast section was then inserted inside the form and lowered until it rested firmly upon the concrete at the bottom. Then cement grout was poured inside the form, the latter being sufficiently long so that grout, in bulk equal to the space between the molded section and the hole left by the pile form, could be placed inside the form. The form was then steadily pulled out of the ground, the grout flowing down and around the cast section and filling in the displacement between the form and the wall of the pile hole. The result was a cast-in-the-ground pile of 16-in. diameter with a 12½-in. diameter octagonal reinforced precast center.

The length of cast section required was ascertained by driving tests. As an example, Table I gives the data of drive test at Station 286, July 5, 1912:

TABLE I. TEST PILE

Total depth driven, ft.	No. blows	Drop of hammer ft.	Wt. of hammer lb.	Remarks
5	20	8	3000	
10	20	10		
15	17	12		
20	7	8		Ground soft between 17 and 20 ft.
22	18	10		
25	22	12		
26	18	13		
27	26	12		
28	27	15		
				5 blows measured 2½ in. penetration = 0.5
29	27	15		10 blows measured 4 in. penetration = 0.4
30	29	15		10 blows measured 3⅓ in. penetration = 0.36

From this and other tests west of the B. & O. R.R. right-of-way, it was ascertained that with an average allowance of 3 ft. for soft concrete in the base of a pile and 2 to 3 ft. for cutoff of pile below surface, precast sections 20 ft. to 23 ft. would be required. The molds or forms for the precast sections were manufactured in 5- and 10-ft. sections at the mill in Pittsburgh and were shipped to Youngstown ready for assembling and setting up on the sills. The ground for the casting hall was carefully leveled and the forms rested upon 3x6-in. sills in such a manner that each 5-ft. section of pile form was supported by three sills. The molds were ordinary box forms with angle pieces set in so that the resulting casting was octagonal with a diameter of 12½ in.

The concrete for molded sections consisted of one part cement, two parts clean sharp sand and four parts clean gravel; it was mixed to a soupy consistency. It was dumped into the molds through the open side of the octagon at the top by means of a bucket with a special gate at the bottom; this gate was controlled by a lever and was so adjusted that it permitted the concrete to flow in proper quantity and speed, into the molds, so that it could be spread and agitated by the laborers with proper precaution so that the steel was covered and the molds thoroughly filled. The cast sections were allowed to set 15 days before being used but ordinarily after seven days they can be safely handled for placing.

Reinforcement of the cast sections was four ¾-in. plain square bars in each pile. The only peripheral reinforcement used was four light wire spacers. As there is no driving on the cast pile in placing, it is not con-

*President, the Cranford Construction Co., Gerke Bldg., Cincinnati, Ohio.

FIG. 2. VIEW OF FOUNDATION WITH SPECIAL PILES IN PLACE
(Note layer of slag fill in upper left-hand corner of view.)

sidered necessary to tie the vertical reinforcement together unless the loads to be carried are excessive for the concrete. The reinforcement was extended 18 in. below the cast section to tie to the concrete base of the pile and the same distance above to form a tie to the footing. The grout filler was mixed one part cement to three parts screened sand; this was made very soupy, so that it would flow easily within the form. It was found that the grout adhered perfectly to the rough surface of the cast section, thus forming a homogeneous concrete pile. In cutting piles to grade in most cases the precast concrete and the grout broke off under the hammer as a mass.

FIG. 3. A SIMPLEX MOLDED INSERTED CONCRETE PILE IN PLACE

Ninety molds were used in the casting hall and the effort was made that one-third of these be filled each three days, meanwhile in the second third the casting of the day before was curing and in the third the castings of three days before were being removed and the molds reset for the next day's casting. Most of the material and all of the concrete and all of the cast sections were handled by a large guy derrick with 100-ft. boom. In ordinary weather cast sections could be handled in three days, in cold weather a longer time was required. Cast sections were handled by means of an auxiliary yard on the derrick boom, this was fitted with two sister hooks, so that the cast section was grabbed about one-third the way down from each end.

Over 700 piles were placed, 14 ft. to 28 ft. in length. Each pile was placed to sustain a working load of 50 tons, which was the actual live- and dead-load designed for the structure. The piles were guaranteed to stand a test load of 60 tons with a settlement of less than ½ in. As the two loading tests made were nearly identical in results the data of one only are given in Table II.

TABLE II. TEST OF SIMPLEX MOLDED INSERTED PILE

Pittsburgh & Lake Erie RR. (Track Elevation, Youngstown, Ohio.)
Soil—Miscellaneous fill, cinder and heavy slag to silt 17 ft. (6 or 8 ft. of silt) below silt loose gravel to firm sand and gravel about 30 ft. below surface.
Method of placing—Molded Inserted, centers 3 ft.
Diameter of pile—Cast in ground 16 in., octagonal cast center 12¼ in.
Length—26 ft. = 23 ft. of molded section on top of 3 ft. gravel concrete.
Reinforcement—Cast section vertical reinforcement four ¾-in. square rods—four spacer wires. Vertical rods extended 2 ft. below cast section and 18-in. above
Concrete—1:2:4 Gravel—Grout 1:3. Set about 30 days before testing.
Penetration. Last Blows, ¼ in. under 3000-lb. drop hammer falling 15 ft.
Test Load—60 tons +.
Settlement. Under full load = 0.013 ft.; recovery upon removal of load, 0.008; permanent settlement, 0.005.
Season—Summer.

The work at Youngstown was performed by The Cranford Construction Co., of Cincinnati and Pittsburgh, for the Pittsburgh & Lake Erie R.R., through the Duquesne Contracting Co., who were the general contractors.

Tractor Trucks for Use with Electric Locomotives*

The Butte, Anaconda & Pacific Railway Company has recently ordered four additional freight locomotives which will be duplicates of the seventeen 80-ton units put in service about a year ago (as described in ENGINEERING NEWS, June 26, 1913). In order to make these locomotives suitable for very slow speed spotting service, there have also been ordered three additional tractor trucks which can be used in combination with the standard locomotive units. These trucks are an adaptation of standard parts of the freight locomotives, increasing the tractive effort of the standard unit to the equivalent of a 120-ton locomotive. These units will be used especially for spotting cars at the smelter and also for low-speed switching in the Butte yards.

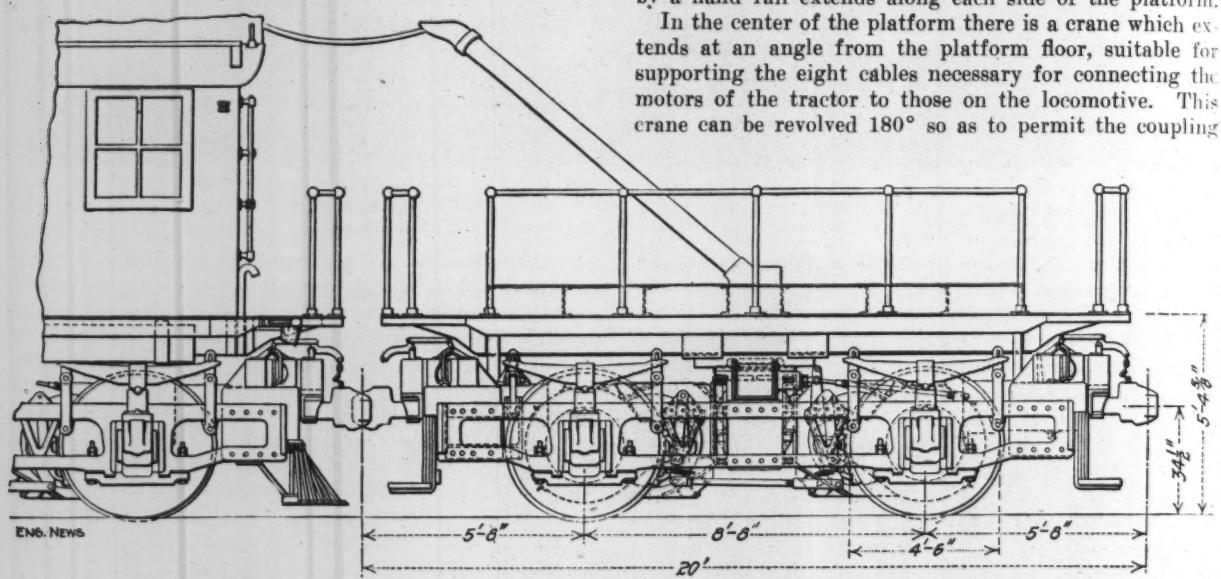
The three two-axle tractor trucks will each be equipped with two motors insulated for 2400 volts, similar to those on the locomotive. In operation, each of the tractor truck motors is connected in series with one pair of motors on the locomotive, making a six-axle, six-motor unit which will furnish 50% more tractive effort than the 80-ton locomotive alone and at about two-thirds speed without increase in current input. Cable and connecting plugs will be provided for operation with the locomotives, so that the truck motors will be operated with the other motors from the same controller without change in the main control. The number of steps will therefore be the same as on the locomotives—ten points with six motors in series and seven with two sets in multiple, each set consisting of three motors arranged in series.

The characteristics of the 120-ton unit are as follows:

Total weight on drivers	240,000 lb.
Starting tractive effort at 30% coefficient	72,000 lb.
Tractive effort at one hour rating of motors	43,200 lb.
Speed at one hour rating, motors in series	4.8 mi. per hr.
Speed at one hour rating, motors in series parallel	10.3 mi. per hr.

Mechanically, these trucks are similar in construction to the trucks on the 80-ton locomotives. Instead of a locomotive body, however, a platform is supplied, built up of channels, angles and plates which are supported on the truck transom. Struts are provided at the corners to secure the platform to the side frame. Ballast, consisting of cement and iron punchings of sufficient quantity to bring up the weight of the truck to 40 tons, is placed between the center channels of the platform in a boxlike structure built for this purpose. A passageway protected by a hand rail extends along each side of the platform.

In the center of the platform there is a crane which extends at an angle from the platform floor, suitable for supporting the eight cables necessary for connecting the motors of the tractor to those on the locomotive. This crane can be revolved 180° so as to permit the coupling of the locomotive to either end of the truck. When in operation, this crane is rigidly locked in position. Air-brake equipment with the necessary triple valve, auxiliary reservoir, etc., is also installed on the truck.



EXTRA TRACTOR TRUCK FOR USE WITH ELECTRIC LOCOMOTIVE OF THE BUTTE, ANACONDA & PACIFIC RY.

Each of the four locomotives now under construction is provided with a junction box placed near the roof above the front window. This is designed so as to permit the removal of couplers with a small amount of labor and time, so that the tractor may be connected to any one of the freight locomotives which is provided with this junction box.

*From information furnished by the General Electric Co., Schenectady, N. Y., makers of the trucks described.

Devices for Eliminating Fatigue are to be exhibited in a museum at Providence, R. I., which has been started by Frank B. Gilbreth, the well known "efficiency engineer," according to "Compressed Air," which suggests that the fatigue of the readers of scientific management "literature" deserves to be relieved in some way!

It seems to us that the desired relief might be obtained by the invention of some device which would compel the prolific producers of this class of literature to read each other's productions, operating on the familiar principle of "making the punishment fit the crime."

Union Station at Dallas, Texas

SYNOPSIS—This station will be for the nine railways entering Dallas and will take the place of five present stations. It is of the through type, with 18 platform tracks (in pairs) and a four-track approach at each end. Passengers will pass from the station building to the platforms by a covered bridge 36 ft. wide, having stairways at each platform. Two similar bridges with elevators, will serve for baggage and express. A concrete viaduct for an interurban line will cross the terminal, and a new bridge over the Trinity River will be required. The work will be done by a terminal company organized by the several railways, and the cost (exclusive of land) will be about $2,000,000.

The conditions in regard to the establishment of a union station for the use of all the railways entering Dallas, Tex., are of interest as indicating the difficulty of securing coöperation between several railway interests, and indicating also the great desirability of having the municipal interests adequately represented in cases of this kind.

The city is served by nine railways, most of which are parts of large railway systems, but under the laws of Texas all lines within the state must be owned and operated by Texas companies. These railways are as follows: the Gulf, Colorado & Santa Fé Ry. (Santa Fé System); the Chicago, Rock Island & Gulf Ry. (Rock Island System); the Missouri, Kansas & Texas Ry. of Texas (M., K. & T. System); the St. Louis, San Francisco & Texas Ry. (Frisco System); the St. Louis Southwestern Ry. of Texas (Cotton Belt System); the Trinity & Brazos Valley Ry. (owned by the Colorado & Southern Ry. and the Chicago, Rock Island & Pacific Ry.); the Houston & Texas Central R.R. (Southern Pacific System); and the Texas & Pacific Ry. (Gould Lines). There is also the Texas & New Orleans Ry. (Southern Pacific System), but this comes in as a tenant of the Houston & Texas Central R.R.

There are now five passenger stations in Dallas, as shown in Fig. 1. Four of these are within a short distance of each other, while the fifth is about a mile from this group. Most of them are inadequate for present requirements, although it is explained that to some extent this is due to the reluctance of the railways to incur large expenditures for enlargement, in view of the agitation for union terminals, which has been the subject of negotiations for a long while.

The New Terminal

In 1907, the railways arranged for preliminary studies of the situation, with the result that five lines (the Santa Fé, Rock Island, M. K. & T., and Frisco Systems, and T. & B. V. Ry.) decided to construct terminal facilities for their joint use. The Gould Lines and Southern Pacific (three lines) also to construct joint facilities, while the St. Louis Southwestern Ry. elected to remain in its present location. Plans on this basis were in preparation, but as the arrangements were not satisfactory to the Dallas municipal interests, further negotiations were begun. These resulted in an agreement (in 1911) that all the companies would join in one terminal if a satisfactory location could be found.

The present site was finally selected in 1912, after a number of sites had been considered. Its principal advantages are proximity to the business center, convenience of access for most of the railways, and freedom from street-crossing difficulties.

The Union Terminal Co. was organized by eight of the lines entering Dallas, the ninth (Tex. & N. O.) being a tenant line, and the stock is owned in equal shares by

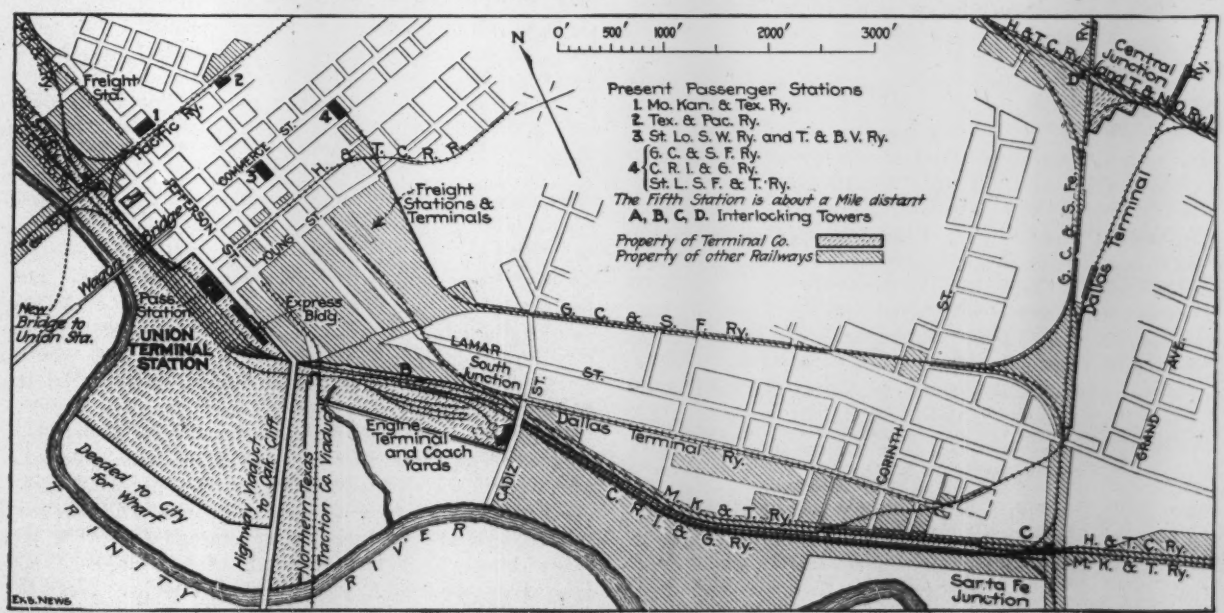

N
0' 500' 1000' 2000' 3000'
Present Passenger Stations
1. Mo. Kan. & Tex. Ry.
2. Tex. & Pac. Ry.
3. St. Lo. S. W. Ry. and T. & B. V. Ry.
4. G. C. & S. F. Ry. C. R. I. & G. Ry. St. L. S. F. & T. Ry.
The Fifth Station is about a Mile distant
A, B, C, D. Interlocking Towers
Property of Terminal Co.
Property of other Railways
Freight Sta.
Pacific Ry.
Commerce St.
H. & T. C. R. R.
Jefferson Bridge
Quinn St.
Freight Stations & Terminals
Waco
New Bridge to Union Sta.
Poise Station
Express Bldg.
UNION TERMINAL STATION
G. C. & S. F. Ry.
LAMAR
South Junction
St.
Engine Terminal and Coach Yards
Dallas Terminal Ry.
Deeded to City for Wharf
Highway Viaduct to Oak Cliff
Northern Texas Traction Co. Viaduct
TRINITY RIVER
CADIZ
C. R. I. & G. Ry.
M. K. & T. Ry.
CORINTH
Dallas Terminal
GRAND AVE.
H. & T. C. Ry.
Central Junction
Santa Fe Junction
EXP. NEWS

FIG. 1. PLAN OF RAILWAY TERMINALS AT DALLAS, TEX., SHOWING THE NEW UNION PASSENGER STATION AND THE OLD PASSENGER STATIONS

these lines. The contract for the construction is to be let very soon. For plans and information we are indebted to C. H. Dana, Chief Engineer of the Union Terminal Co.

Track Plan

The track plan is of the through type as shown in Fig. 1. There are four lead tracks from the north, 18 station tracks arranged in pairs (of which 10 tracks are intended for immediate construction), and four main tracks to the southward (of which two are intended for immediate construction). The station tracks in each pair are spaced 13 ft. c. to c., while the spacing between pairs (across the platforms) is 28 ft., as shown in Fig. 2. The shortest track can accommodate 14 coaches, and the longest, 20 coaches; this is on the basis of 70 ft. to a coach, with an allowance of 60 ft. for engine and tender.

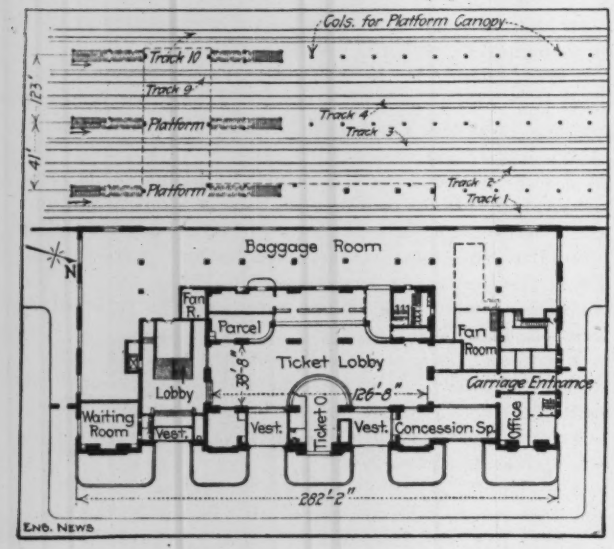


Fig. 2. Plan of First Floor and Track Level of the Union Station at Dallas, Tex.

As it is necessary also to take care of the freight traffic of the various railways, provision is made for the construction of two tracks for freight exclusively from North Junction to South Junction, at both of which points connections are made with the different railways. These tracks, however, will be open to the use of any other company which is party to the agreement. In addition, provision is made for a third track to be constructed on demand of the St. Louis Southwestern Ry. for its exclusive use, between North Junction and South Junction. For the present, this company will use the two freight tracks mentioned. From South Junction to Santa Fé Junction, provision is made for four tracks, but at present it is expected that two will take care of both passenger and freight traffic.

Crossings and Bridges

The Texas & Pacific Ry. crosses at grade just north of the north throat of the terminal, and this cannot be avoided under present circumstances. High-water conditions, as well as the necessity of the connections shown on the map, prevent the depression of the Terminal tracks, and the very great cost of elevating the Texas & Pacific Ry. through the city makes that impracticable at present. At Commerce St., the existing highway bridge is raised and an additional sum added at the east end, crossing the Terminal tracks, descending to the present grade at Houston St. on a grade of 5.5%.

At the south end, there was constructed about four years ago a viaduct of concrete arches across the Trinity River and its bottoms, connecting the city with the suburb of Oak Cliff. There was provided a clearance of 32 ft. above the present tracks under this viaduct, but high-water conditions have made it seem advisable to use only 18 ft. for the proposed work. This fact, together with the necessity of keeping the elevation of the Commerce St. bridge as low as possible, to avoid an excessive rate of grade in its approaches, has decided the clearance of all the overhead structures at 18 ft.

Immediately south of the Oak Cliff viaduct the tracks of the Northern Texas Traction Co. cross the present tracks at grade. These tracks accommodate the traffic of the local lines to Oak Cliff, and also three interurban electric lines to Fort Worth, Waco and Corsicana. The traction company has arranged to construct a concrete viaduct across the valley, crossing over the Terminal tracks. Cadiz St. crosses the Terminal tracks at grade, and as it is an unimportant street, with very little travel, no attempt will be made to separate grades for the present. When changed conditions require this separation, it will be practicable to carry the street overhead.

At Santa Fé Junction, there will be constructed an undercrossing, consisting of a reinforced-concrete box 11x11 ft. There are no other crossings, of any kind, between North Junction and Santa Fé Junction, and no probability of any being demanded in the future, as railway interests own practically all the lands between the terminals and the river.

In order to admit trains of the Texas & Pacific Ry. to the facilities, it is necessary to construct a new bridge across the Trinity River. This bridge is located on a curve of 11° 30′, and consists of a through span, 150 ft. long, 26 ft. c. to c. of trusses. Whenever required by the U. S. Government, this span will be converted into a lift span, the river being technically navigable. At South Junction, Mill Creek will be conducted under the tracks by an extension (100 ft. long) of a double 12-ft. arch, with 6-ft. bench walls, now under existing tracks.

Passenger Station

The building is to be 282x135 ft. and 70 ft. high, with its front 35 ft. from the west building line of Houston St. This street is 80 ft. wide between building lines, has no car tracks, and is the principal thoroughfare from Dallas to the populous residence district of Oak Cliff. The building is designed in the Renaissance style of architecture, with a base of Texas granite and the upper part of brick. The building will rest on a solid rock foundation, 25 ft. below floor level.

The plan of the first floor and track level is shown in Fig. 2. The front part contains a spacious lobby and ticket office, with baggage checking room opposite, parcel check room, emergency hospital and stores. The rear part will be devoted to a large baggage storage room. The carriage concourse is located north of the building, and reached by a corridor from the ticket lobby. Near the south end, a broad staircase leads to the second floor, where are located the various waiting rooms, restaurant, etc. The foot of this staircase is immediately opposite

a wide opening to Houston St. and its head directly in line with the passenger bridge or thoroughfare over the station tracks. This permits direct travel between the street and trains, without passing through the ticket lobby or waiting rooms.

On the second floor (Fig. 3) will be the general waiting room for whites, 135x70 ft., with a high-arched ceiling extending to the roof of the building. A large loggia extends along the front of this waiting room, and affords an outdoor adjunct to it, while a concourse inclosed by glazed sash stretches along its track side. North of this room are the white women's waiting and retiring rooms, with toilets and baths, and matron's room; and also the restaurant facilities. At the south end are the white men's smoking and toilet rooms, barber shop and baths, and the waiting rooms and toilets for colored people.

Provision is made for the usual conveniences, an information booth at the south end of the principal room, an adjacent parcel checking booth (connected by dumb waiters with the parcel room on the first floor), telegraph and telephone booths, news stands, etc. The third floor consists of two unconnected parts, over those parts of the second floor north and south of the general waiting room. The south wing will be used for dispatcher's office, con-

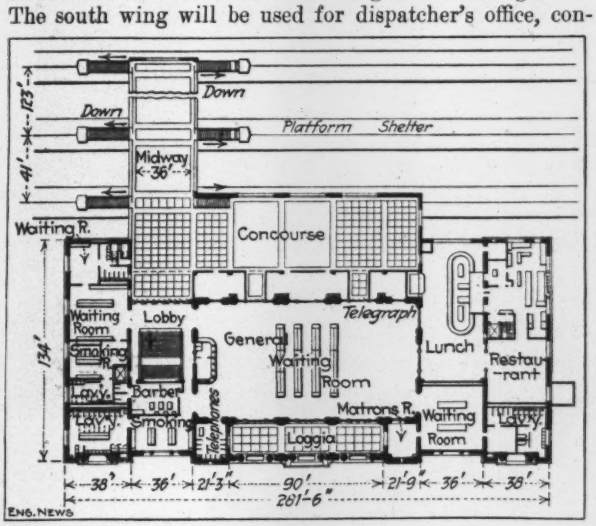


FIG. 3. PLAN OF UPPER FLOOR OF UNION STATION AT DALLAS, TEX.

(The midway is a wide bridge extending from the concourse across the tracks, with stairways to the platform.)

ductors' room, and offices of the Union Terminal Co. and Pullman Co. The north wing will in part be assigned to the restaurant service.

To avoid the necessity of crossing tracks at grade, bridges have been selected in place of subways. The latter were not desirable owing to the difficulty of waterproofing them, as they would be partly below high-water line and partly constructed in a high fill.* A bridge 36 ft. wide in the clear, built of girders incased in concrete, spans all tracks from a point opposite the head of the staircase mentioned above. The walls of this thoroughfare are of glazed sash. From it the track platforms are reached by stairways on each side (Fig. 3).

*The new union station at Wichita, Kan., is an example of a station with subway approaches to the platforms, and this was described in "Engineering News," Mar. 26. The overhead arrangement at Dallas is somewhat similar to that of the union station at Kansas City ("Engineering News," Aug. 7, 1913), but in the latter case the entire waiting-room is built over the tracks and the street approach is at this upper level.

The platforms between the pairs of tracks will be 18 ft. wide, and 6 in. above the tops of the rails. They will be of different lengths, but extending generally to the clearance points of the station tracks. They are to be covered by reinforced-concrete shelters or canopies of the butterfly type, extending from the passenger bridge which spans the tracks at the middle to the baggage bridges at either end. The extreme ends of the platforms will be left uncovered.

For the accommodation of the three express companies, a one-story building 500x50 ft. is located south of the station building, with a 40-ft. teamway along its east side and tracks for carload express on its west side. The floors of the building and platform are 3 ft. 9 in. above the roadway and tracks. South of this building will be erected a garage for housing the electric trucks which it is planned to use. In order to reach trains with baggage, express and mail matter, two bridges 15 ft. wide (of the same type as the passenger thoroughfare) will span the tracks, 300 ft. north and 300 ft. south of the thoroughfare. These will have elevators for trucks at their east ends and also at each platform.

OTHER FEATURES

CAR YARDS AND ENGINE TERMINALS—Facilities for caring for and storing passenger equipment and engines, and making emergency repairs, are to be located at South Junction. At this location is placed the power plant for furnishing heat, light and power for the terminal facilities. The details for these facilities have not been decided.

INTERLOCKING—There will be two new interlocking plants, one at North Junction to control the crossings and connections, and the switches at the north ends of the station tracks; the other at South Junction, to control the crossings and connections there, and the south switches of the station tracks. The character of these plants has not yet been decided. The existing plants at Santa Fé Junction and Central Junction will be enlarged.

LANDS—The Union Terminal Co. has leased from various railways a part of its holdings, and has also purchased at a cost of $1,750,000 about ten acres of property, for the most part expensive business blocks improved with high-grade warehouses. In addition, in order to obtain the vacation of the various streets intersecting the site, it was necessary to purchase over 80 acres of river-bottom land lying west of the site, between the Commerce St. bridge and Oak Cliff Viaduct. Of this tract, 32 acres have been given to the city for wharfage purposes (if the Trinity River should ever become navigable), upon the express condition that there should never be any other streets opened at grade across the Terminal tracks.

Salaries of City Officials in the 195 cities of the United States having a population of 30,000 or more are given in a report issued by United States Bureau of the Census. The cities are grouped into five population classes. For these the range of salaries in each class is as follows: 500,000 population and over, Chicago, $18,000 and New York $15,000 to Detroit, $5000; 300,000 and 500,000, Cincinnati and New Orleans, $10,000 to Milwaukee, $4000; 100,000 to 300,000, Seattle $7500 and Paterson, N. J., $2000; 50,000 to 100,000, Mobile, Ala., $5000 and Saginaw, Mich., $1000; 30,000 to 50,000 inhabitants, Superior, Wis., $5000 to Flint, Mich., $100. Regardless of class, the salaries of city clerks ranged from $8000 in New York to $800 in Allentown, Penn., and $600 (plus fees) in Superior, Mo.

Spheroidal-Tank Gas Holders, A Modern German Type

Of the many differences between American and European gas-holder construction, an interesting one is represented in the three photographic views herewith. They show gas-holders of the spheroidal-tank type, a novelty brought out a few years ago by the Maschinenfa[illegible] Augsburg-Nürnberg (Gustavsburg, near Mainz, [illegible]many), under patent.

The spheroidal-tank construction accomplishes a [illegible] reduction of tensile stress in the tank containing [illegible] holder, and hence reduction of the thickness of t[illegible] plating, which makes a considerable saving in the [illegible]

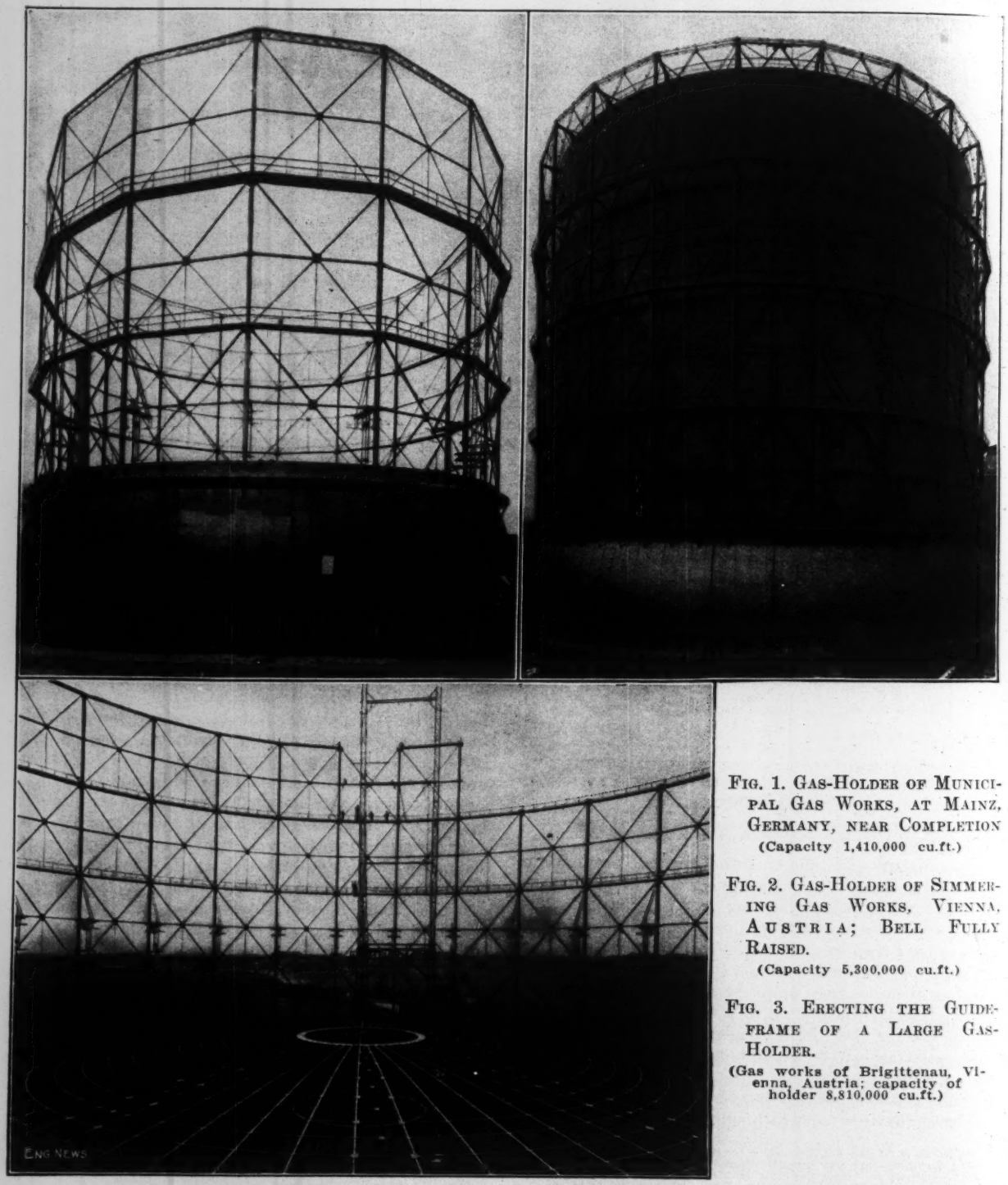


FIG. 1. GAS-HOLDER OF MUNICIPAL GAS WORKS, AT MAINZ, GERMANY, NEAR COMPLETION
(Capacity 1,410,000 cu.ft.)

FIG. 2. GAS-HOLDER OF SIMMERING GAS WORKS, VIENNA, AUSTRIA; BELL FULLY RAISED.
(Capacity 5,300,000 cu.ft.)

FIG. 3. ERECTING THE GUIDE-FRAME OF A LARGE GAS-HOLDER.
(Gas works of Brigittenau, Vienna, Austria; capacity of holder 8,810,000 cu.ft.)

SPHEROIDAL-TANK GAS-HOLDERS, A MODERN GERMAN TYPE

weight of steel in the structure. In the ordinary cylindrical holder tank, the plating must resist the full water pressure on half the diameter of the tank. By curving the tank sides in the vertical planes, and making this curvature much sharper than the horizontal curvature, the water pressure is resisted mainly by tensile stresses acting along the meridian planes (vertical sections) of the tank. Since the tank is not a closed figure, however, the meridian tension must be counteracted by vertical struts inside the tank, as the upper edge of the tank would otherwise sag down and cause the vertical tensions to disappear. By making the vertical curvature to much smaller radius than the horizontal curvature, the tensile stress is reduced (just as it would be reduced by decreasing the diameter of a cylindrical tank), and therefore lighter plating may be used.

Further saving of metal, however, results from the fact that the horizontal ring-tension remains in action to a small degree, i.e., the metal exerts both vertical and horizontal tensile resistance; thus, only part of the total water pressure has to be resisted by the vertical tension, and part by the horizontal. A correct adjustment of vertical curvature to horizontal curvature will result in so dividing the load between vertical and horizontal ring-actions as to develop the full allowed stress in the metal in both directions. This secures maximum economy.

The proper shape of the tank is not truly ellipsoidal, i.e., the vertical curve is not truly circular, because the increase in water pressure from top to bottom calls for sharper curvature near the bottom. The tank profile is laid out with due regard to this condition.

Figs. 1 and 2 herewith show two tanks of small to moderate capacity, at Mainz, Germany, and at Simmering (near Vienna, Austria), respectively. The characteristics of the tank construction will be apparent from these views. The holder guides are of the ordinary radial type.

Fig. 3 shows the crown and guide-frame of a very large holder (nearly 10,000,000 cu.ft.) during construction. A tower traveler with electric hoist, operating on a circular track around the holder, handles the guide-frame erection.

State-Aid Road Work in Wisconsin

The state-aid road-improvement work now being done under the Wisconsin Highway Commission will cover some 1600 miles of road during 1914. But of the 1200 townships of the state, about 1000 will do road work. In 1913, about 800 townships were engaged in the work, but this was prior to the 1913 amendments to the state-aid law, which extended the scope of the law to villages and cities under 5000.

Practically all of this year's mileage involves grade revision; there is also a material amount of relocation and new road construction. As to character of surfacing, A. R. Hirst, State Highway Engineer, classifies the work as follows:

	Miles
Concrete road	65
Waterbound macadam	420
Gravel	265
Shale or clay on sand	110
Graded but not surfaced	750

The cost of the state-aid road work averages less than $3000 per mile. The usual width of surfacing is 9 ft.; and it is claimed this is found to be ample, with well-kept shoulders, for all road purposes except on the most heavily traveled sections. The most costly piece of road work is being done in Milwaukee County, where an 18-ft. concrete road is being built at a cost of about $18,000 per mile.

Local commerce needs are the controlling purpose of the state-aid road work in Wisconsin, under the system whereby county or town may initiate a piece of work. Every state-aid road must be part of a system previously outlined by the county board as a main county road system, and many of them will, when the connecting links are improved, form part of through routes. But the plan of procedure is radically different from that of states in which through routes are taken up primarily, if not exclusively.

The Highway Commission is made up of three appointive members whose six-year terms overlap, and two *ex-officio* members (the dean of the College of Engineering of the State University, F. E. Turneaure, and the state geologist, W. O. Hotchkiss). This arrangement is expected to go far toward assuring continuity of purpose and method, and freedom from political entanglement.

The larger part of the state-aid work is done by county or township labor direct. The results are claimed to be amply sufficient to justify the continuance of this method. In each county, work is in charge of a county highway commissioner, elected for two years by the county board from an eligible list prepared by the State Highway Commission upon examination. The amended law provides that if the commissioner is reëlected for a second term he shall hold the office permanently. This provision aims at removing the highway work from the chances of politics and change, and building up of a body of experienced, capable men to direct road work throughout the state.

The Growth of Land-telegraph Systems in the United States in the five years from 1907 to 1912 is shown in the accompanying table recently issued by the U. S. Bureau of the Census. The figures cover commercial operating companies only, and all the systems except one are operated by companies incorporated in the United States. One company, included in the report (Western Union), does both land and ocean telegraph business and no segregation of officers, number of employees and financial operation was made. The systems operated by the Federal government for military or commercial purposes were not included, nor the incidental telegraph business done by telephone companies over their own wires. Miles of pole line is exclusive of that wholly owned and used by railway companies. The number of employees does not include railway operators doing work also for telegraph companies. Differences in systems of accounts between 1907 and 1912 to some extent invalidate comparison of reports for those years. For instance, the figures for 1907 include no statement of charges for depreciation or sinking fund, and these charges for 1912 could not be deducted without disclosing individual operations.

	1912	Per Cent. of Increase 1907-1912
Number of companies or systems	22	10.0
Miles of pole line	247,528	3.3
Miles of single wire owned and leased	[1]1,814,196	15.0
Number of messages	103,536,418	5.7
Number of telegraph offices	30,781	5.9
Income, total	$56,293,469	28.2
Telegraph traffic	52,337,211	38.0
All other sources	3,956,258	—34.0
Expenses, total	52,862,425	38.2
General operation and maintenance	39,067,011	22.6
Interest and taxes	2,740,827	22.0
All other expenses	11,054,587	167.1

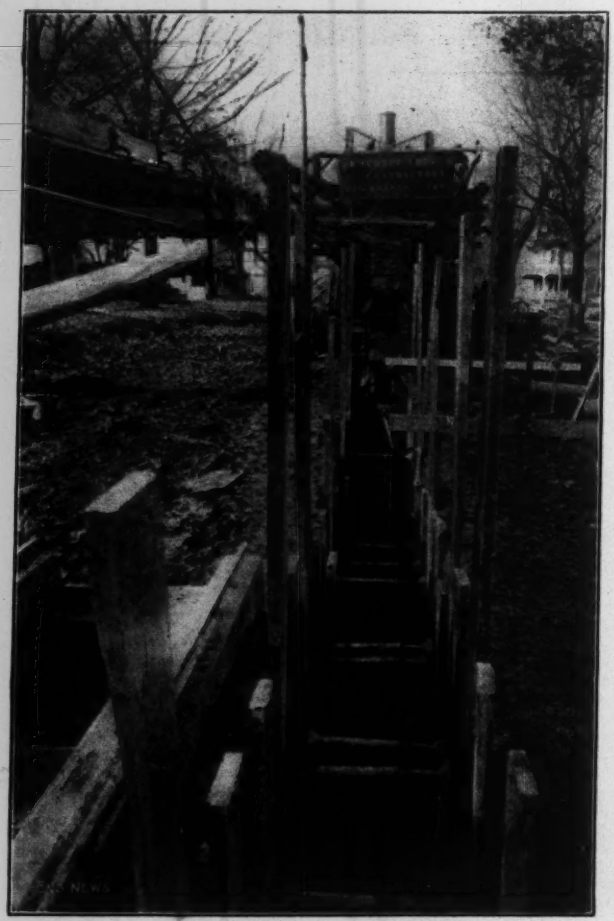
[1]Does not include 22,816 nautical miles of ocean cable operated by one land telegraph company. Exclusive also of 314,329 miles of wire wholly owned and operated by railway companies for their own business.

Field and Office

Rapid Construction of a Small Sewerage System By Trenching Machines

By Charles P. Chase*

The little city of Tipton, Iowa, with a population of about 2500, concluded to build a sanitary sewerage system for the whole city in one contract. A topographical survey showed that the sewage of the entire city could be discharged through one outlet by cutting through a rather deep ledge, with a cut varying from 20 to 30 ft., which was considered more economical than the construction of two disposal plants, with their care. The contract was let to one contractor, who, after starting the work abandoned it and forfeited his bond. A new letting was had and the work awarded to the J. W. Turner Improvement Co., of Des Moines, Iowa. The rapidity with which the work was constructed, the economy attained by the use of automatic trenching machines, and the method of the contractor, may be of interest to those engaged in this line of work.



A Trenching Machine on a 28-Ft. Sewer Cut, Tipton, Ia.

(The machine cut to a depth of 24 ft. and the remaining depth was excavated by hand. The trench was 28 in. wide.)

The excavation, for the greater part, was in fine clay, but in many cases it was of such a character that if excavated by hand it would have required bracing or even sheeting, where the excavating machines went through so rapidly that the trench was dug and the pipe laid before the banks began to work.

The trenching machines were made by the G. W. Parsons Co., of Newton, Iowa, and were capable of cutting to a depth of 24 ft., and up to a width of 5 ft. (see accompanying view). They were equipped with back fillers that carried the dirt directly from the excavators back into the ditch to a distance of about 40 ft., and were capable of some extension.

The back-fill was carried on a belt along one side of the trench and then side dumped into the trench so that no dirt was left on the street except directly over the ditch.

The small section of track seen in the view is that used for the standard which supported the weight of the rear end of the back-filler, and the two short sections of this track were moved ahead as the work progressed.

The writer considers the back-filler a very important and economical part of the apparatus, where it can be used. It is certainly a matter of great convenience to the users of the street, as the latter is open for travel immediately after the machine passes.

The deepest cut made by the machine was 24 ft. Where the trench ran over this the balance was taken out by hand. There was about one mile of cut averaging from 20 to 30 ft., through which the trenching machine proceeded at an average rate of about 40 ft. per day, using from 8 to 12 men. In the lighter cutting, up to about 10 ft., the machine made from 400 to 600 ft. per day. In addition to the machines, the contractor ran four or five hand gangs, and if a machine struck bad ground it was immediately backed up and a hand gang thrown in and the machine taken to drier ground. Borings and test pits were made of the work ahead, so that the hand gangs and machines could be placed and used to the greatest advantage.

By this careful analysis and planning of the work, the contractor was enabled to put in the whole system of ten miles in seven months' time, making a run of over three miles in the best month. The trenching machines, in a 10-ft. cut, with a force of ten men, would do the work of a hand gang of 125 men.

From about ten years' observation of the operation of trenching machines, the writer has come to the conclusion that their services as to efficiency and economy depend almost entirely on the good judgment of the runner and

*Manager, Iowa Engineering Co., Clinton, Iowa.

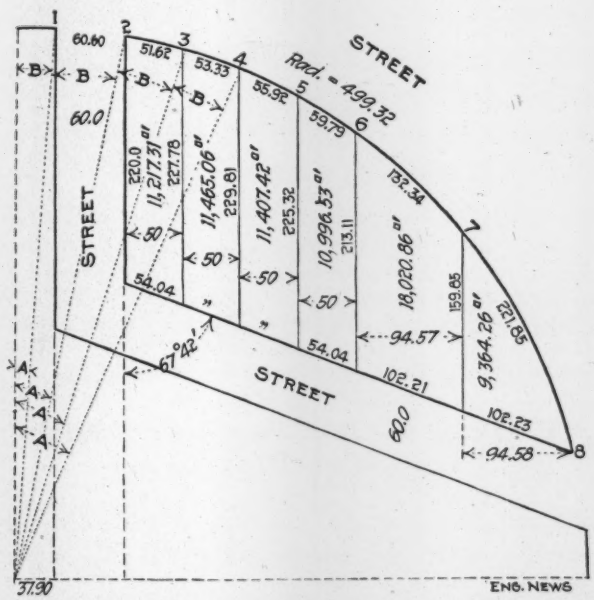
proper arrangement of the work, so as to place the machine where the best results can be attained, and not attempt to take everything with a machine simply because there is one on the job.

The engineering for this work was done by the writer, acting for the city of Tipton.

Computation of Lot Lines on Curved Streets

By P. H. Skinner*

Computations involving lots of equal width, abutting on a curved street, may be much shortened by properly arranging the work. For clearness, the given quantities are underscored in the accompanying sketch; the other dimensions are all computed.



In whatever form the data may be presented to the computer, it may be reduced to that shown in the sketch—that is, where the perpendicular distances of the lot lines from the center of the circle are known. For convenience, all lines abutting on the curve will be referred to as lot lines.

The table given is arranged for machine computation. the writer having used a calculating machine in this class of work for several years, with a saving of about 50% in time. For those who prefer the old style logarithmic calculations, a few minor changes in the table are necessary, but these will be discussed later. The machine method gives a clearer idea of the working of the table, whether logs or machine be used.

First Column—Here we post the numbers of the lot lines, calling the nearest to the center, 1; the next, 2, etc. Corresponding numbers are given on the sketch for convenience in identifying the lines.

X Column—At the head of this column we post the distance of the first lot line, and add successively the widths of the following lots, thus obtaining the distance of each lot line from the center.

Sin A Column—Designating by A the angle between a radius to the extremity of any lot line, and the radius parallel to the lot system, then $\sin A = x/R$. Taking the case shown in the table as an example, to avoid too frequent use of general terms, we first find the value of $37.90/R$, $50/R$, and $60/R$. At the head of the column we post the value of $37.90/R$, = 0.075903, add the value of $60/R$, = 0.120163, $50/R$ = 0.100136, etc., thus obtaining by addition the various values of $\sin A$.

A Column—In this column we post the angle A in degrees, minutes, and seconds, to whatever degree of accuracy is required, from the values of $\sin A$ in the preceding column.

R = 499.32 1/R = 0.002002724 R² = 249,320.46 f (50) = 0.100136 f (60) = 0.120163

	x	Sin A	A	Cos A	y	B	Arc B	Seg.
1.	37.90	.075903	4°21′10″	0.997115	497.88	4°21′10″		
	60.00	.120163				0.069813		
						0.006109		
						0.000048		
						0.075970	37.93	
2.	97.90	.196066	11°18′25″	0.980591	489.63	6°57′15″		
	50.00	.100136			220.00	0.104720		
					269.63	0.016581		
						0.000073		
						0.121374	60.60	
3.	147.90	.296202	17°13′50″	0.955121	476.91	5°55′25″		
	50.00	.100136			249.13	0.087266		
					227.78	0.015999		
						0.000121		
						b = 0.103386	51.62	
					(Sin 5°55′25″)	= 0.103203		
						s = 0.000183		22.81
								11,194.50
4.	197.90	.396338	23°21′	0.918101	458.43	6°07′10″		11,217.31
	50.00	.100136			228.62	0.104720		
					229.81	0.002036		
						0.000048		
						0.106804	53.33	
						0.106601		
						0.000203		25.31
								11,439.75
5.	247.90	.496474	29°46″	0.868054	433.44	6°25′		11,465.06
	50.00	.100136			208.12	0.104720		
					225.32	0.007272		
						0.111992		
						0.111758	55.92	
						0.000234		29.17
								11,378.25
								11,407.42
6.	297.90	.596610	36°37′40″	0.802527	400.72	6°51′40″		
	94.57				187.61	0.104720		
					213.11	0.014835		
						0.000194		
						0.119749	59.79	
						0.119462		
						0.000287		35.78
								10,960.75
								10,996.53
7.	392.47	.786009	51°48′50″	0.618218	308.67	15°11′10″		
	94.58				148.82	0.261799		
					159.85	0.003200		
						0.000048		
						0.265047	132.34	
						0.261955		
						0.003092		385.45
								17,635.41
								18,020.86
8.	487.05	.975407	77°16′13″	0.220353	110.03	25°27′23″		
			11°18′25″			0.436333		
			65°57′48″	1.343903		0.007854		
			1.134464	0.004654		0.000111		
			0.016581	0.000063		0.444298	221.85	
			0.000233	1.348620		0.429824	673.38	
			1.151278	673.39		0.014474		1804.95
			0.913285					7559.31
			0.237993	42,806.50				9364.26
				29,668.21				
				72,474.71				

*Chief Computer, Surveyor's Office, District of Columbia, Washington, D. C.

Cos A Column—If the machine method is followed, we post in this column the values of *cos A*; if logs are used, we post the values of *log cos A*, giving the column the proper handling.

Y Column—This contains the values of *R cos A*; if the machine method is adopted, we "set" *R* on the multiplicand index, and cause the values of *cos A* to appear on the multiplier index, when the values of *y* will appear on the result index, and are posted in their proper order in the column.

If logs are used, we add *log R* to *log cos A*, which gives us *log y*, from which we obtain the values of *y*, which we post as in machine computation. We may shorten the work of adding *log R* to *log cos A* by writing *log R* on the extreme lower portion of a slip of paper, placing it just above *log cos A*, and adding. This saves us the necessity of writing *log R* repeatedly, and eliminates chances of error in copying *log R* incorrectly.

In machine computation we are now in a position to check the work performed up to this stage, by adding the squares of *x* and *y*. If no error has been made, the sum of these squares will equal R^2. With a machine of the sliding carriage type this check for the eight angles shown in the table should be performed in less than 5 min.

Another useful check is provided by the "method of differences" for *A*, *cos A*, *y*, and the areas, to be obtained later. This check is applied by subtracting each quantity from the preceding one and noting any irregularity in the differences. This applies only when a large number of lots of equal width is involved.

The sketch calls for a depth on the west line of the first lot of 220 ft. Subtracting this distance from the *y* of that lot line (see Column Y), we have a remainder of 269.63 ft. From this point the rear line of the lots makes an angle of 67° 42′ with the lot system. The remainder for each lot then, is the lot width multiplied by *cot* 67° 42′, out of 269.63. Subtracting this length successively from 269.63 and posting the results under the corresponding *y*, and subtracting, we have the depth on each lot line. The final result, 110.03, affords a check on the work.

B Column—Designate by *B* the central angle subtended by the arc between two adjacent lot lines; then *B* may be obtained by subtracting any value of *A* from its succeeding value. The first value of *A* in the table is used merely to check the work. Having determined the various values of *B* and posted them in their proper places in Column *B*, we may check the subtractions by adding all the values of *B*. If the sum is equal to the last value of *A* (77° 16′ 13″ in this case) the work is correct.

The next step is to express *B* in circular measure, calling its new form *b*; we may check the operation by adding all the values of *b* and comparing with the *b* of the last value of *A*; from each *b* we subtract *sin B*, calling the difference *s*.

Arc B Column—By the machine method we merely multiply *R* by the various values of *b*, to obtain the arcs forming the frontages of the lots; by the logarithmic method we write *log b* in Arc B Column, and add *log R* as in the case of *cos A*. The resulting arcs are posted in their proper places in the column. We may check the work by adding all the arcs and comparing with the total arc.

Seg Column—As will be seen by reference to the sketch, the area of each lot except the last consists of a trapezoid and a segment of the circle *R*. The areas of the trapezoids may be found in the usual manner, while the areas of the segments are best obtained from the formula $S = R^2/2\ (b - sin\ B)$, where *S* is the area of the segment.

The quantity *s* in *B* column is evidently $(b - sin\ B)$, hence we have only to multiply the various values of *s* by $R^2/2$ to obtain the areas of the segments, which we post in the segment column, adding the areas of the corresponding trapezoids to obtain the area of each lot, as shown.

Final Check—As a final check we determine the area of the entire figure formed by the lots, which we compare with the sum of the areas of all the lots. In the case discussed here, the figure has an area of 72,474.71 sq.ft., while the sum of the lot areas is 72,471.44 sq.ft., an error of 3.27 sq.ft., which is as nearly correct as may be expected where the angles (with one or two exceptions) are given only to the nearest 10 seconds and the distances to the nearest 0.01 ft.

To perform the computation to a greater degree of accuracy would have meant expressing the angles to the nearest second, and the distances to the nearest 0.001 ft., requiring the expenditure of much more time. The land involved in this computation was assessed at 15c. per ft., hence the money value of the error is 49c. To spend a dollar's worth of time to save 49c. worth of land is evidently poor economy. The value of the property involved must determine the degree of accuracy to be used in the computation.

A Fixed Cableway Used with Transfer Platform

In building a concrete-arch bridge near Beaver, Penn., a short time ago, concrete was supplied to the work by cableway. With fixed cableway towers, all the advantages of a traveling cableway were secured by using a simply arranged transfer platform.

The arrangement was first used in building the deep cellular foundation piers of the bridge. The platform was arranged to travel along the top of the pier, on two rails laid on caps of a trestle built up in the hollow interior of the pier. As the pier concreting progressed upward, the trestle was built up in successive lifts. The cableway bucket was dumped onto the platform, this was run along the pier to the point where concrete was wanted, and here the concrete was shoveled into drop-pipe hoppers. The view shown in Fig. 2 illustrates the arrangement.

In supplying concrete to the arch barrels, a similar rig for supporting the platform was used. The view, Fig. 1, shows the cableway bucket and the track of the platform (on the opposite page).

The work was done by the Cummings Structural Concrete Co. for the Pittsburgh & Lake Erie Ry. The bridge is notable in being almost all curved work; the piers are curved to suit tracks below, and even the internal walls of the (cellular) piers are radial and circumferential to the curves of the lower tracks and both faces of the arch are curved, one being a simple curve while the other is a reverse curve, suiting the railway tracks carried by the bridge.

FIG. 2. TRANSFER PLATFORM IN ARCH CONCRETING

Points in Derrick Design

Weak spots in the design and construction of derricks were discussed a short time ago before the Engineers' Society of Western Pennsylvania, on the occasion of a paper read by E. Godfrey, "Strength of Equipment for Handling Loads." The following extracts from the paper and the general discussion are grouped according to details.

STIFFENING THE BOOM

"In a guyed derrick the mast must be high enough to allow the boom to pass under the guys. In many stiff-leg derricks, the boom is twice as long as the mast. Derricks with masts 30 to 35 ft. long and booms 60 to 70 ft. long are not uncommon; such derricks need special care on account of the long boom, and the problems entailed thereby. One of these problems is the support of the long and slender boom. Frequently the dead end of the boom line is hitched to the boom about at the middle of the boom to support the weight. The writer sees no objection to this so long as the strain is not too great for the weight of the boom. Hog rods with one or two intermediate posts are very useful in reducing the unsupported length of a boom. These should be used where slender booms are employed. It is best to use them on all four sides of the boom.

"The strength of slender compression members under lateral loads is something that has been neglected in engineering literature.* The writer will not attempt to

*See Godfrey's discussion, with formulas and calculations, in "Engineering News," ,1914.

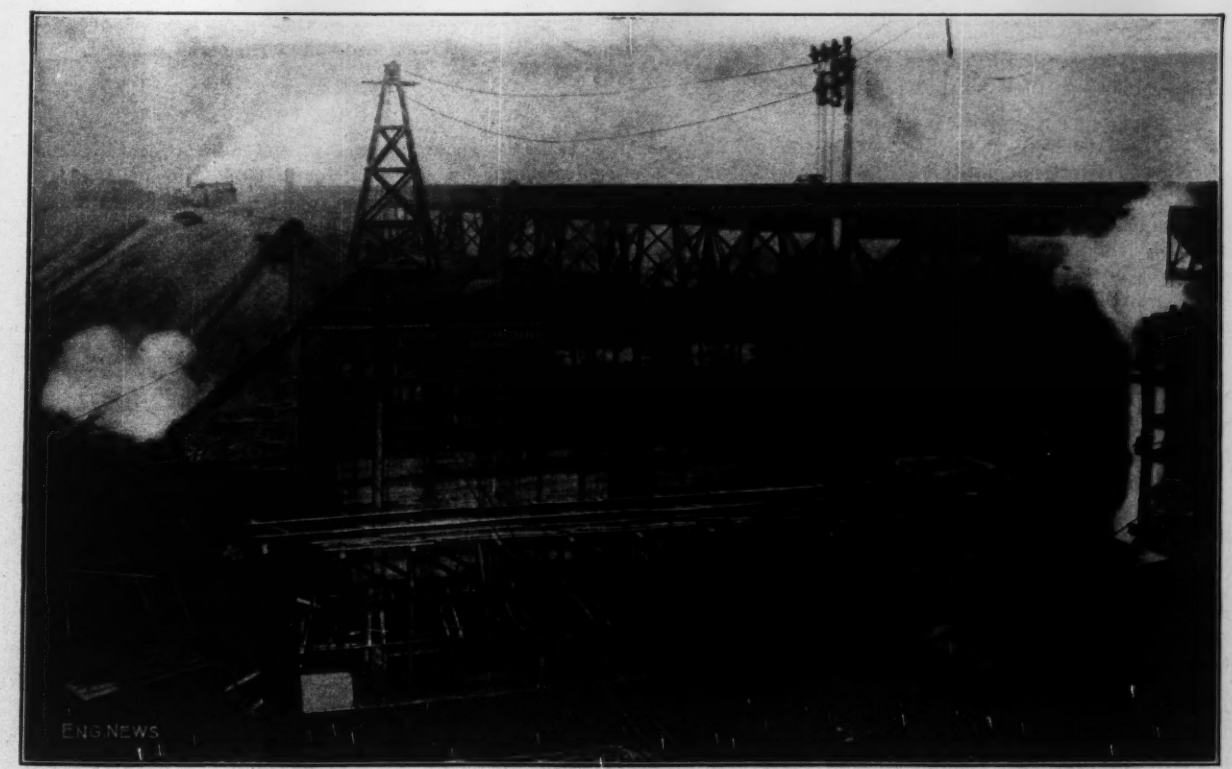


FIG. 1. FIXED CABLEWAY AND TRANSFER PLATFORM IN PIER CONCRETING

go into this at this time except to point out that long booms should be supported so that their weight will not be so large a factor in producing stress."—[E. Godfrey].

Mr. Godfrey gave the safe compression in a 14x14-in. boom 70 ft. long as about 9 tons when not stiffened and 16 tons when stiffened. P. E. Hunter (Independent Bridge Co.) said that he has frequently lifted 15-ton loads on a derrick with a 70-ft: boom and 36-ft. mast, both made of 14x14 timber; and 27½ tons with a low boom on a derrick made of 16x16 sticks.

Mast Step

"The base detail of a derrick is important, especially in a derrick having a long boom, on account of the large horizontal force against the foot of the mast. The writer knows of one case where a derrick was set on two 12-in. by 12-in. timbers. with a low boom the horizontal force was sufficient to rock these heavy timbers. The sheaves for the boom line and the hoisting line were placed between these timbers. The remedy used was to bolt the timbers together, using spacing blocks." [E. Godfrey.]

"I have noted quite a number of failures due to not getting the proper supporting strength under the mast. Very frequently, they place the lay-legs over beams and girders whose connections are not sufficient to take care of the load coming on the mast. Any engineer knows how to figure that action as a lever, or overhanging beam, and knows that the load on the mast may be three times as much as the load being lifted, and if there is barely the strength in the beam or girder connection to support the load on the end of the boom, there is not sufficient to take care of the load from the mast."

"In the case of guy derricks it is a good thing to throw out kickers very carefully, so that there is no chance for the timbers under the step to move in any direction. If these things are watched, a great many accidents can be avoided." [P. E. Hunter.]

Mast Top

"The gudgeon pin is the pin at the top of the mast placed in a vertical position. The goose-necks, large iron straps fastened on the ends of the stifflegs, pass over this gudgeon pin. This pin is sometimes too small in size and not firmly held at the extreme end of the mast, resulting in crushed fibers of the mast, or a bent pin. There should not be merely a ferrule driven in the top of the mast with the pin in a hole in the wood, but there should be a steel plate over the end of the mast in which the pin fits snugly, the plate being bent down over the sides of the mast, or a detail equivalent to this. Also, the mast should be securely bolted a short distance from the end to prevent splitting." [E. Godfrey.]

"In derrick construction, the question of gooseneck design is very essential. Faulty design at this point has been the cause of many serious accidents. A design we follow is to make the gooseneck out of two or more plates, having one plate come over and the other plate under the stiffleg and bolting through timber and plates. This design throws the bend line at a different point on each of the plates, and as the break usually occurs at the forged sections, such failure could be discovered before the other plate broke." [Geo. W. Nichols, John Eichleay, Jr., Co.]

"I do not favor the construction of gudgeon pin which has been used ordinarily; that is, a pin passed down into the timber. I believe more satisfactory results are obtained by putting the gudgeon pin right on the face of the mast, making the construction of angles or channels, with a plate in back of them between gudgeon and mast, and the gudgeon pin between the angles channels. It is easy to figure out the bending moment and one can see the condition of pin and mast at all times; further, in the case of a wooden mast, there is no danger of splitting it. Have the sheave block so constructed that the side straps, instead of being made to attach to a hook or bent for a clevis, extend a sufficient distance beyond the plates separating the sheaves that a bolt may pass through them. Sheave blocks of this type may then be attached to the gudgeon-pin construction referred to by means of a flat bar with a hole in each end, this bar being made of any length desired.

"The only objection that can possibly be raised against this construction is that of the eccentric loading of the mast, and this objection is slight as compared to the advantages." [P. E. Hunter.]

"Referring to stiffleg derricks, I would call attention to the fact that in certain positions of the boom, one of the stifflegs acts in compression, which throws tensile stress on the gudgeon. It is imperative that tensile stress be provided for in securing the gudgeon pin in place." [Willis Whited, Bridge Engineer, State Highway Department.]

"All derricks should have downcomers attached to the tops of the stifflegs and brought down to the sill close to the mast and securely held; these usually consist of cables or chains and steamboat ratchets. This arrangement prevents the stifflegs shearing the bolt or other ineffective means for holding the stifflegs in place over the gudgeon pin. [Geo. W. Nichols.]

"Another thing is the necessity for downcomers. Very frequently, particularly with the socket type of step, the mast will jump out and the entire rig come down." [P. E. Hunter.]

Sheaves

"It is the general rule that the sheaves for ropes and cables should be of a diameter 30 or 40 times that of the cable or ropes. While this rule is observed in stationary sheaves, for elevators, inclines, etc., it is very generally ignored in equipment for handling loads. This is not a very serious matter, however, as it simply means that cables will wear out in a shorter time. Thirty-inch sheaves on a derrick using ¾-in. cable would be very much in the way. The rule can scarcely be adhered to in ordinary equipment.

"In the matter of the sizes of pins in sheaves there is room for improvement in common practice. If the ordinary methods of figuring bridge pins were applied to sheave pins, many of them would be found to be very highly overstressed. Many designers figure such pins for shear only. This is a mistake. The bending moment is the governing factor in a pin, and in fact the only one that needs to be considered.

"The writer has checked the designs of many derricks and has talked with the designers. There is a general disregard of engineering principles, particularly in the matter of bending moments on pins, exhibited both by the designers and by their work. Pins 1¼ to 2 in. in diameter are the common standards. The extreme fiber stresses calculated in the usual way are often in excess of the ultimate strength of the steel, just like the highway bridge designs of 25 years ago.

"When pins are in iron or steel bearings, they can be considered as having high bearing pressure, thus shortening the lever-arm for bending, but when they are in wood the high pressure would crush the fibers of the wood. It is important in such cases that the pins be of extra large size, so that they will not bend." [E. Godfrey.]

"Round steel subjected to bending stress will carry heavier loads than the calculations would indicate, owing to the fact that the assumption on which the calculation is based is only partially correct, the effect of the error being greater in the case of relatively shorter spans. This fact has saved many sheaves from failure. The principal object of making the pins small is to reduce the loss by friction." [Willis Whited.]

SAFE STRESSES

"In the erection of a big structure, if an engineer will figure the derrick fittings at 16,000 lb. outside fiber strain, 20,000 lb. for bearing, and 12,000 lb. for shear, he will be fairly safe. The class of work is one where the load comes on suddenly, and if it is being worked with judgment, 16,000 lb. working strain is positively the ultimate that anybody should work to." [P. E. Hunter.]

"The unit-stress which the author advocates, 10,000 lb. per sq.in., seems to me to be rather small, in view of the fact that men handling heavy loads are apt to be very careful when the load approaches the capacity of their equipment, care being taken to avoid any impact due to slipping chains, etc., when the full load is being lifted." [Willis Whited.]

Handling Gravel and Sand from Barge to Coal Bunker to Job

BY J. C. LATHROP*

A unique instance of the utilization of existing mechanical facilities during the construction of new work, was found in the method adopted for handling gravel and sand while building an addition to the Westport Power Station of the Consolidated Gas, Electric Light & Power Co., of Baltimore, Md.

The bulkhead line near this station is about 270 ft. from the station proper, and as the cheapest possible

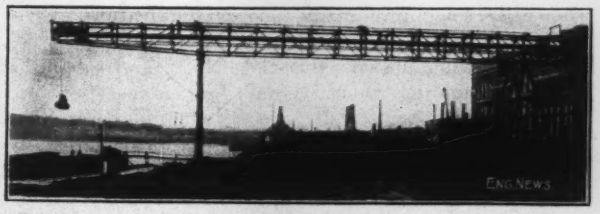


FIG. 1. HANDLING MATERIAL FROM BARGE TO COAL BUNKER

method of delivering sand and gravel to this work is by large, an existing gantry crane with a man-trolley, carrying a 2½-ton grab bucket, installed for handling coal, was used for unloading this material.

An attempt was first made to deliver from this grab bucket directly to dump wagons near the station. However, as the grab bucket held about two wagonloads, it was found difficult to load these wagons without spilling material on the ground and making it necessary to keep a man shoveling the overflow from the ground to the wagon. It was also difficult to synchronize the delivery of the bucket with the movement of the wagons, in order to make the process of handling continuous.

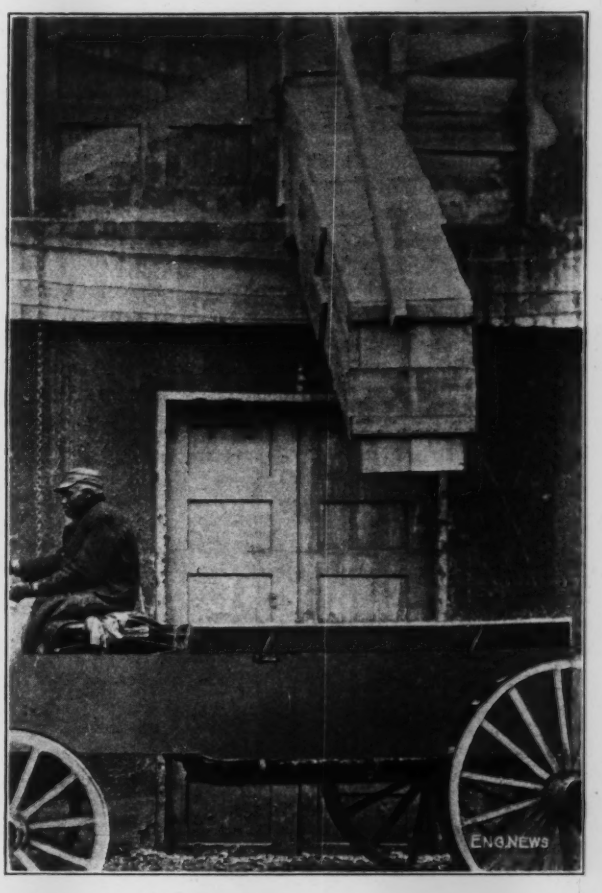


FIG. 2. CHUTING SAND OR GRAVEL FROM BUNKER TO WAGON

At the suggestion of Mr. Croughan, Chief Engineer of the plant, the gravel and sand were deposited in the end coal bunker and a temporary wooden chute built from one of the gates at the bottom of this bunker, through the main doorway, in such a manner that the wagons could be loaded directly from the bunker, as shown in Fig. 2. By this method, all spill was obviated, and it was possible for the man-trolley to unload a full barge of either gravel or sand, without reference to the rate of hauling to the storage pile. This, of course, obviated the difficulty mentioned above; the handling was uninterrupted.

It was found that either gravel or sand could be unloaded from the barge and deposited in the bunker (through the medium of the crane and man-trolley shown in Fig. 1) at the rate of 60 tons per hour. No record was kept of the time required to haul this material, as this depended almost entirely upon the number of wagons in service. This system was very successful in saving time and adding to convenience on this particular job.

*Consolidated Gas, Electric Light & Power Co., of Baltimore, Lexington and Liberty Sts.

Hydrographic-Survey Methods, Cape Cod Canal Channel Excavation

By E. F. Verplanck*

To describe the special field methods that were developed by the writer to insure the measurement of all soundings upon desired cross-section lines, which it was necessary to repeatedly reproduce, the actual operations in the survey of a typical section will be given; for example, the channel between Sta. 460 and 480 (Fig. 1).

The channel here consists of a series of three tangents. All of the fixed triangulation points, range points and pile dolphins, etc., are referenced by their perpendicular

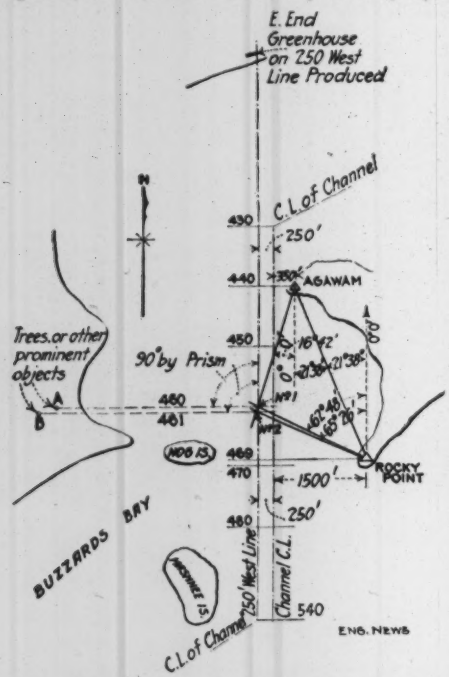


Fig. 1. Section of Channel of Cape Cod Canal in Buzzards Bay, Showing Survey Methods

distance from the channel center line, and by the stationing of the point on center line at the foot of the perpendicular. These two quantities, which for convenience can be called the offset and stationing, completely determine the position of any point with respect to the center line of the canal.

Fieldwork—Five men were required to make this survey. Three were detailed to a rowboat, in which their duties were to row, sound and record, respectively. The other two men set up transits over two of the fixed shore points of the triangulation system, from which the channel is laid out.

For this survey, the transits occupied the triangulation stations Agawam and Rocky Point (Fig. 1). The following requirements governed the selection of these stations: One line of sight between transit and sounding must make throughout the survey an inclination to the center line of not less than 15°, and the other line of sight must be more or less at right angles to the center line.

*Care Cape Cod Construction Co., Buzzards Bay, Mass.

The sounding method here consisted in establishing upon the desired cross-section line, two temporary sighting points, one on the water and one on the shore. These were used as a cross range, by which the oarsman was guided in rowing across the channel on the cross-section line.

For one signal, a range pole 15 ft. long (or a buoy in deep water) was set on the cross-section line, just outside of the top of slope of the channel. The other range was any prominent object on shore. Its location on the desired cross-section line was established by using a right-angle prism. It is obvious that the ranges must both be on the same side of the channel. In case the channel faces the open sea, the range pole must be placed between the channel and shore.

The range pole was set by angles from the two transits. The transitmen used flags mounted on long poles to signal the required movements. The angles for the correct position were computed on a slide-rule. This computation was a simple one, because of the simple form of layout of the channel and of the triangulation system.

The inclination of the center line to the line between any two triangulation stations is expressed by the following simple trigonometric relation:

$$\tan of\ inclination = \frac{algebraic\ difference\ of\ offset\ distances}{difference\ in\ stationing}$$

This relation is used in obtaining the desired orientation of the lower plate, as for example in Fig. 1:

Agawam, Sta. 440, 350 ft. east of center line.
Rocky Point, Sta. 469, 1500 ft. east of center line.
Difference in offset = 1150 ft.
Difference in stationing = 2900 ft.

$\frac{1150}{2900}$ = tangent of 21° — 38′.

This angle was set off on the transit circles to the left, and the two plates of each transit were clamped together. The two transits were then lined in on each other, and the lower plates clamped. The upper plates were then unclamped and all angles measured were thus referred to a line parallel to the center line.

Range-pole No. 1 was set from the transit stations at a point 250 ft. west of the center line on cross-section 460. Range-pole No. 2 was set 250 ft. west on cross-section 461, by one angle and a range point on shore, this being quicker than the two-angle method. As each range-pole was set, a right-angle prism was used to establish the shore signal on the same cross-section range. Generally some prominent topographic feature was selected.

After having placed range-pole No. 2 and established its corresponding shore signal for cross-section 461, soundings were taken eastward across the channel, returning westward on the next cross-section 460. Then range-pole No. 2 was moved to the range of cross-section 462 and range-pole No. 3 set at cross-section 463. With the three range-poles, the work was thus kept up continuously.

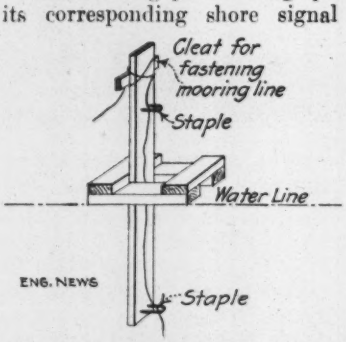


Fig. 2. Buoy for Deep-Water Signal

Below Sta. 500, the entire bay is over 15 ft. deep. Here, buoys, Fig. 2, were used instead of range-poles. The strong tidal current carried the buoys 10 or 15 ft. off line, if the mooring line was long enough to prevent them being carried under water. In order to have the buoys in a reasonably accurate setting it was necessary to make allowance for this effect of the current in anchoring them. For work at the lower end of the channel, where nearly 30 ft. of water existed on both sides of the channel at high tide, an accuracy of 10 ft. in the setting of the buoy was always obtained.

Where the water was less than 1000 ft. from shore to shore, it was economical to establish two permanent

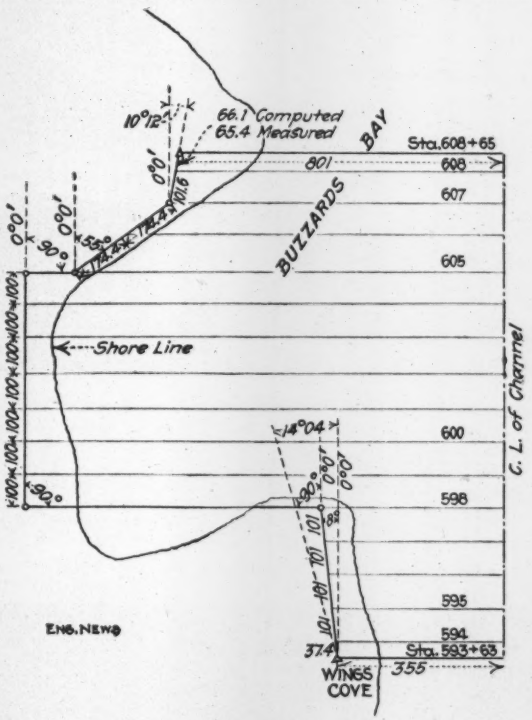


FIG. 3. TRAVERSE SURVEY FOR ESTABLISHING PERMANENT SHORE SIGNALS

signals or targets on shore for each cross-section range. Fig. 3 shows a traverse survey for this purpose between Sta. 594 and 608. The distances measured between stations of the traverse are, of course, quickly obtained by dividing the distance between the center-line stations by the cosine of the angle of inclination of the traverse line to the center line.

PLOTTING SOUNDINGS—Where the soundings have been taken so close to the cross-section line that the assumption involves an error of less than 1 ft. in the distance from the center line to the sounding, this distance, called offset, can be expressed in terms of the observed angle to the sounding boat as follows:

Offset = Difference in stationing from transit station to cross-section × Tangent of observed angle — Offset from center line to transit station.

For example, in Fig. 4:

Difference in stationing, Agawam to 461 = 2100 ft.
Observe angle = 12° 20'.
Offset of Agawam = 350 ft.
Offset of sounding = 2100 ft. × tan. 12° 20' — 350 ft. = 109 ft. west of center line.

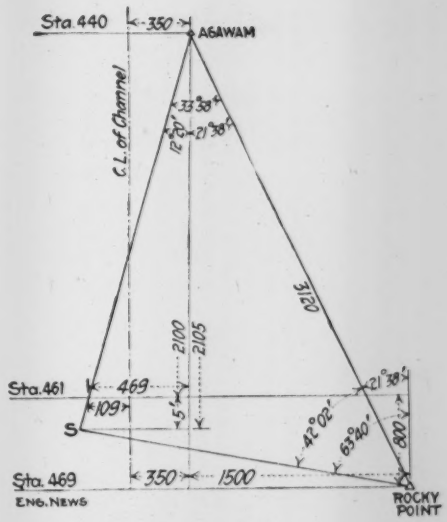


FIG. 4. METHOD OF LOCATING SOUNDINGS, CAPE COD CANAL CONSTRUCTION

A transitman can read and record time and angle, perform the above operation on a slide-rule, and record the offset distance, in 20 seconds. Angles were observed every 30 seconds.

The angles taken from the other transit station were not used except for checks on the alignment of the sounding boat on the cross-section lines.

The work described was done by the writer under the direction of C. T. Waring, Resident Engineer, of the Cape Cod Construction Co., of which William Barclay Parsons, of New York City, is Chief Engineer.

City Engineer's Office Methods

The following data from the recently issued annual report of the Commissioner of Public Works of St. Paul, Minn., give the office methods of a large city engineering office quite succinctly.

INDEXING—Card indexes are kept: (*a*) Of recorded plats; (*b*) of park plats; (*c*) of established grades on streets and alleys; (*d*) of contracts, indexed by street and name of contractor; (*e*) current index of preliminary and final orders from the Board of Public Works and the letting of contracts thereon; (*f*) index to all survey notes; (*g*) graphic index to monuments as established; (*h*) general index, openings, vacations, slopes, sewers, etc., including special and general structures; this is one of the largest and most comprehensive of the indexes, made necessary by the wearing out of the present book system, and is about 90% complete. Full advantage has been taken of numerous opportunities for cross indexing, including the same plat under various heads, such as location, character of work, departments, etc.

BOOK-KEEPING—A card-index system of book-keeping was so planned as to serve as a journal and ledger record.

FILING—A card index of field books taken from vault is kept. The clerk in charge of records charges all books against the employee using them, and is able to locate the party having them, giving them credit when records are returned.

Building Emergency Suspension Bridge

At Indianapolis, a crossing from the grandstand over the track of the Motor Speedway was required recently, and a suspension footbridge was built, as shown by Fig. 1. It spans about 80 ft., from a guyed bent on the left to a support and anchorage on the grandstand building on the right. Hangers at 3-ft. intervals carry light c joists on which longitudinal floor planking is laid. T who take pride in structures built by rough-and-r methods may be pleased to learn that this structure erected in too great a hurry for the formality of ma drawings." In actual use it is said to have proved i equal to every demand, and this is taken as a guara of its safety.

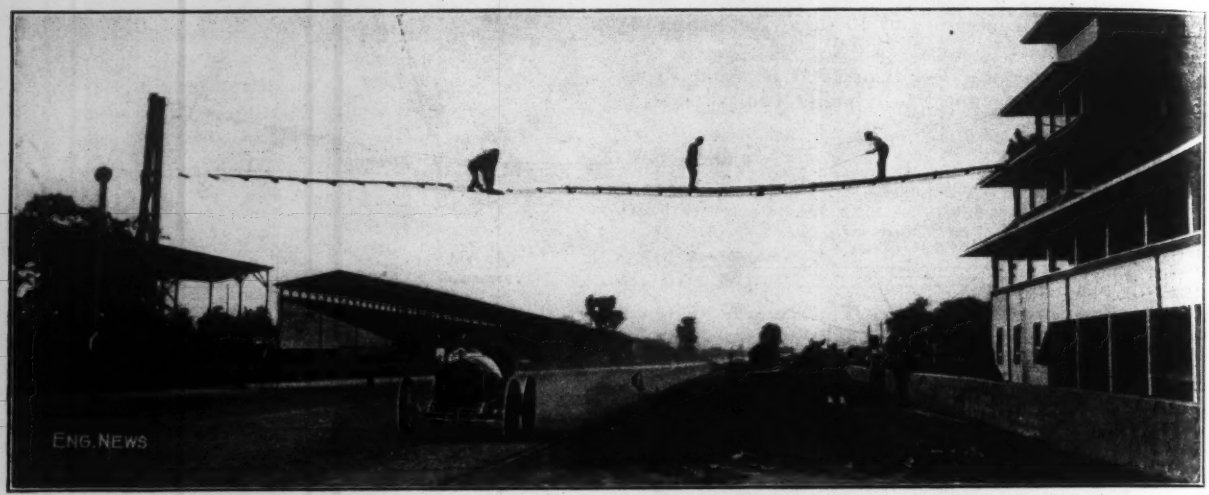


FIG. 1. FOOT BRIDGE OVER INDIANAPOLIS MOTOR SPEEDWAY

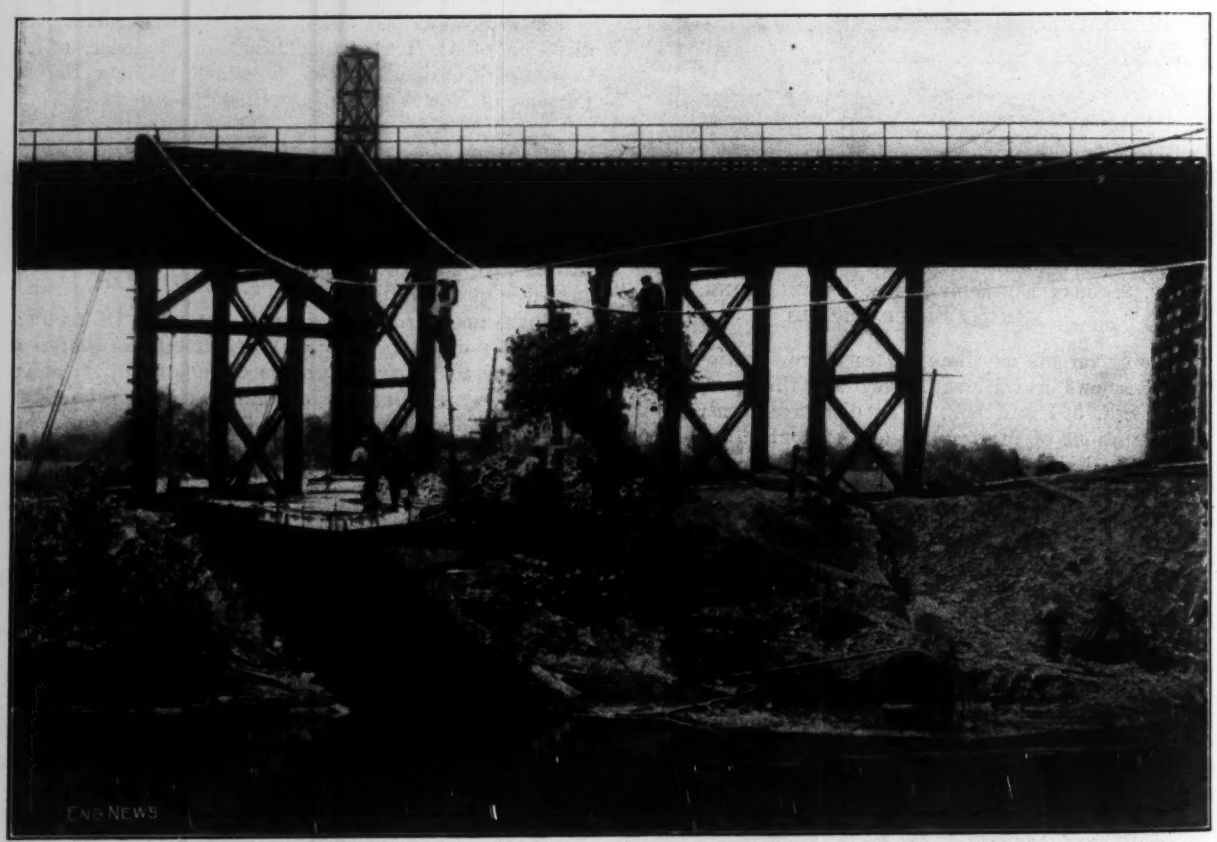


FIG. 2. ROAD BRIDGE OVER MAHONING RIVER, YOUNGSTOWN, O.

More careful planning was shown at Youngstown, Ohio, in undertaking the construction of a suspension bridge across the Mahoning River at Northwest Ave. This bridge, though only about 16 ft. wide, is likely to have to carry general road traffic. Its span is something over 300 ft. Two 2½-in. steel cables clamped together by cable clamps at 5-ft. intervals, form each of the two suspension members; they are carried on timber bents and anchored back to deadmen. The floor-beams are steel I's, suspended by doubled hanger ropes looped over the cables and around the ends of the I's, with clamp fastening of the loose end. Wooden longitudinal joists resting on the I-beams carry the floor planking.

The bridge was designed in the office of the city engineer, F. M. Lillie. The original plan did not contemplate the use of stiffening trusses, but these may be added if the bridge proves very flexible under traffic loads.

The Youngstown bridge replaces a fixed bridge washed out by the great flood of March, 1913, and its emergency successor, a pontoon bridge, which was itself carried away. Money for a permanent bridge is not available at present, and the suspension bridge is built as a cheap temporary structure. How temporary it will be cannot be foreseen, of course; it may be kept in use a long time, to postpone the expenditure for a permanent bridge.

NOTES

The Erection of Two 25,000-Gal. Steel Water Tanks on the roof of a power station, about 65 ft. above the ground, was performed in a rather unusual manner. Instead of shipping the sheets to the site and erecting them with a gin-pole as is customary in such construction they were riveted up complete in the shop and hauled to the site on trucks drawn by ten horses, as shown in Fig. 1.

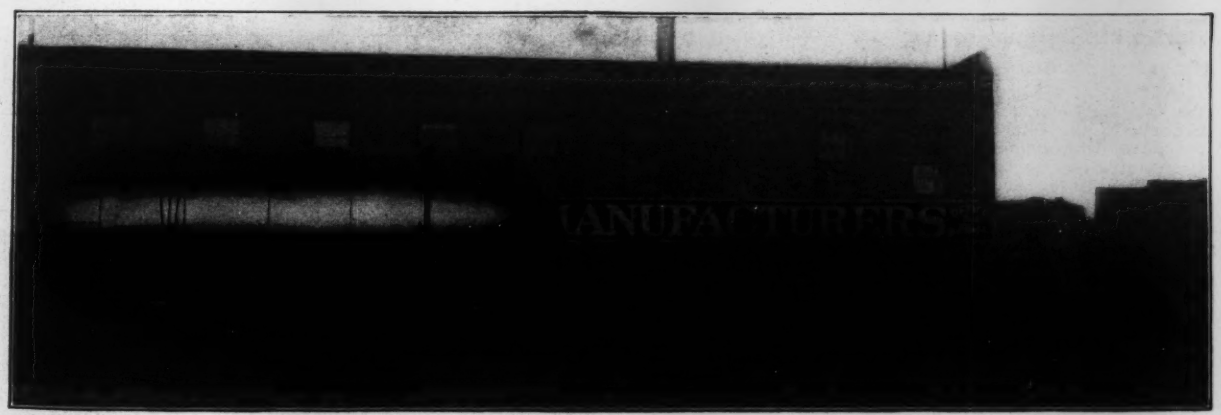


FIG. 1. TRUCKING A 25,000-GAL. STEEL WATER TANK

The tanks were 30 ft. high by 12 ft. diameter and weighed about nine tons each. They were lifted to their final position by means of the same guy derrick used for erecting the steel work of the building. Fig. 2 shows the derrick swinging the first tank into position.

The tanks, which are to supply the general service water for the Westport power station of the Consolidated Gas, Electric Light & Power Co., of Baltimore, were furnished and erected by the Bartlett-Hayward Co., of Baltimore.

Deflection of Beams Under Triangular Loading—Solutions of this problem sent by several readers employ in part the principle of regular double integration of the moments (equal to the second derivative of deflection with respect to distance along beam), and in part the principle of area moments, or the integration of the product of moments times distance along beam, which requires but a single integration. In applying the latter principle, N. K. Sheppard (East Saginaw, Mich.) forms the integral for the deflection of each inch with respect to the point of maximum deflection. Since the formulas give the deflection from the tangent, the only point of the beam which will make the deflections of the two ends equal is the point of maximum deflection. The result is the same as by the other method, namely, distance from end of zero loading equals 0.5193 l; and the maximum deflection is $\frac{0.01305\ Wl^3}{EI}$.

The deflection at the middle of the beam is precisely the same as the deflection at the middle of a uniformly loaded

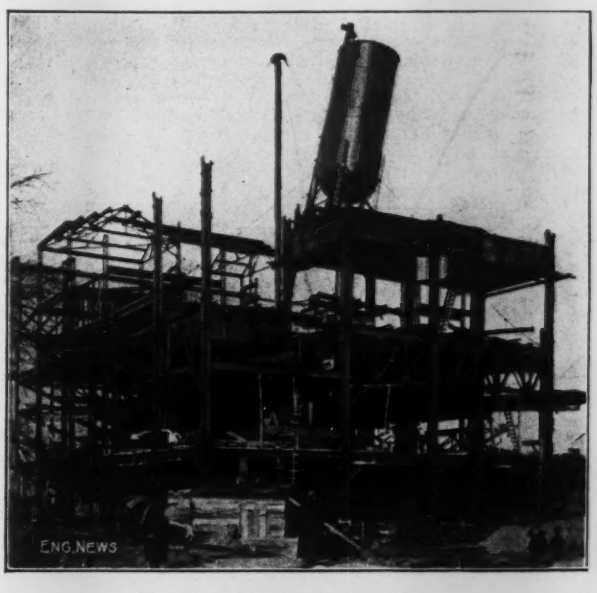


FIG. 2. SETTING THE TANK

beam, provided the total load is the same in the two cases. This deflection is $\frac{5}{384} \times Wl^3$. The deflection at the middle of a beam under trapezoidal load is also the same amount as at the middle of a uniformly loaded beam or at the middle of a beam under triangular loading, again under the proviso that the total load on the beam is the same in the several cases (Prof. James E. Boyd, Columbus, Ohio).

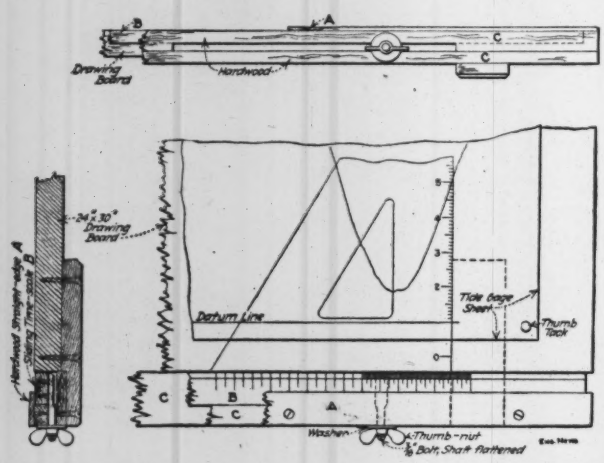
Since the point of maximum deflection under triangular loading is less than 2% of the span, away from the center of the beam, and under trapezoidal loading must be still nearer the center of the beam, and since the amount of the maximum deflection in the case of triangular loading is only 0.2% different from the deflection at the middle, and under trapezoidal loading is still closer to the mid-span deflection, it is unnecessary to bother about any other deflection value than that at

the center. This, as already brought out, is equal to that for a uniformly distributed loading of the same total amount on the entire beam, namely, $\frac{5}{384} \times Wl^3$ (Prof. R. K. Schlafly, Columbus, Ohio).

Device for Reading Heights from a Recording Tide-Gage Chart—The standard type of recording tide-gage used by the United States Coast and Geodetic Survey, and extensively by other engineers in connection with harbor and channel surveys, revolves with a speed of 1 in. per hr., so that where the range of tide is considerable a considerable difference of height can take place within a few minutes.

The hours are automatically marked on the chart when the tide curve is made, but these hour marks have to be corrected for any error of the tide-gage clock. To avoid further graduation of the time scale on the chart the device shown in the accompanying illustration was constructed and used by Fred W. Johnson, of the City Engineer's office, Oakland, Calif., for reducing gage heights in connection with the hydrographic survey of Oakland Harbor, described in "Engineering News" of Aug. 21, 1913, p. 362.

The sheet, or a portion of the roll taken off the gage for



DEVICE FOR READING HEIGHTS FROM A RECORDING TIDE-GAGE CHART

the day that soundings were taken, is thumb-tacked to the board with the reference plane set so as to read 1 ft. on a graduated triangle resting against the bottom straight-edge. Half-tenths can be easily read on the vertical scale, which is close enough for sounding work.

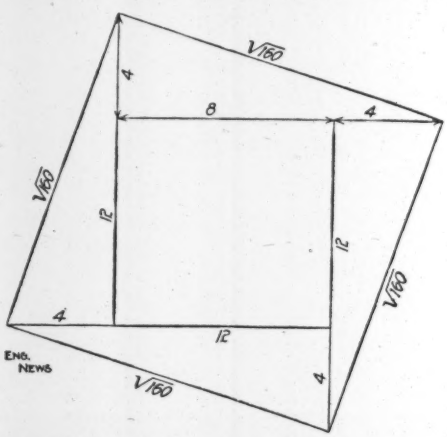
The reference plane is made parallel to the bottom straight-edge. The adjustable time-scale B reading to five minutes is set to coincide with the corresponding hour mark on the tide curve. The hours for the part of the curve to be read are marked off so as to prevent any misreadings of the hours. The heights can then be read for any hour and minute recorded during the soundings for that day.

Street Monuments at All Four Corners must be set in newly plotted or subdivided property in Youngstown, Ohio (within the city and up to a distance of three miles from the city limits), according to rules promulgated by the plotting commissioner, Veeder Heasley. The preferred type of monument is one of concrete, at least 6 in. in diameter and 30 in. deep, with the upper 6 in. of the height molded to neat regular form; and a ½-in. iron pin, 2 ft. long, embedded in the concrete (no requirement is made as to marks on the pin). The top of the monument must be between sidewalk grade and a level 3 in. below. Monuments must be set "at the intersections of the side lines of all streets or alleys and at the angles of all streets or alleys and at such additional points as will definitely locate the boundary of the plot and all street lines."

This requires a monument at each of the four corners of an ordinary street intersection. No center-line monuments are set. Instead of concrete monuments as described, stone monuments may be accepted, if at least 6 in. square and 30 in. deep, neatly dressed. For points other than street corners, simple iron pins may be used, but these must be at least 1¼ in. in diameter and 3 ft. long.

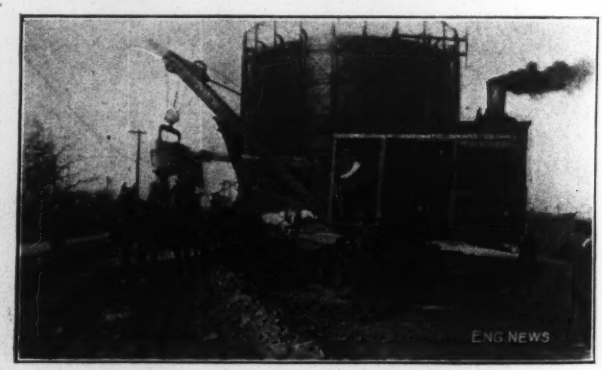
The rules in which the above requirements are included were promulgated about two years ago. At first they met with some opposition, owners objecting for instance to the expense of setting so many monuments. The opposition soon appeared, however, and the advantages gained by full monumenting and uniform procedure in plotting are generally recognized.

How to Lay Out a Square Acre—This is an old problem and the solution shown may be familiar to many of our older readers, but apparently it has not found its way into modern text-books on surveying. The method shown is sent to us by Robert G. Thomas, Professor of mathematics and surveying at the Citadel, Charleston, S. C., who gives the following directions: A square is laid out with sides 8 rods in length;



each side is prolonged half its length, or 4 rods. Then the ends of the prolonged sides are joined making the sides of the resulting square each $\sqrt{160}$ rods in length, and the area of the inclosed square 160 sq.rd. = 1 acre.

Steam-Shovel Work Down to 1-Ft. Cut has been found economical in street-grading work in Minneapolis, Minn. All the grading work is being done by direct labor at the present time, under direction of F. W. Cappelen, City Engineer. It is found an advantage in running the work to keep down the amount of labor needed, and this is a factor in making such light steam shovel cuts economical.



STEAM-SHOVEL IN SHALLOW CUT IN ROAD-GRADING WORK

Toadstools Destroy Asphalt-Macadam Road—Last fall an old macadam road in Hillsboro, Calif., was resurfaced with 1½ in. of asphalt. This spring toadstools forced their way through the macadam and lifted the asphalt surface about 2 in., causing it to break up and allow the toadstools to appear on the surface. This happened in two different places along the line of work, and in one place a large toadstool lifted its head and broke its way through 4 in. of asphaltic concrete, which had been laid the year before. It would no doubt be a difficult matter to estimate with any degree of accuracy the force required to break through this pavement, but it is certain that a tremendous pressure must have been exerted by the growing toadstools. [From Albert Raisch, of the Raisch Improvement Co., Hillsboro, Calif.—Mr. Raisch verified at our request a newspaper dispatch we were rather reluctant to believe.—Ed.]

Editorials

Engineers as City Planners

The number of engineers who engaged in the city-planning competition at Richmond, Calif., described elsewhere in this issue, and the fact that one of the second-prize winners and a number of competitors who received honorable mention were engineers, is but a single of many recent indications that city planning will in the future offer many opportunities for engineers. A number of engineers have taken prominent part in the National Conference on City Planning in this country during the past five years and several have been engaged by American city-planning commissions. In England, a number of members of the Institution of Civil Engineers have joined with architects and others in forming the Town Planning Institute and city engineers and surveyors are there playing an indispensable part in the scores of projects now in various stages of adoption under the Town Planning Act. The city-planning movement is bound to spread in all parts of the world, and with its spread there will be many demands for the services of competent engineers.

Painting Freight Cars

It hardly seems possible that the enforced economy which has prevailed in railway business during the past year or two can have extended so far as to cut off the purchase of paint for freight cars; but the general appearance of freight cars throughout the country is proof positive that many millions of dollars' worth of valuable equipment is rapidly going to decay for the lack of preservative paint.

It may be of little importance whether a freight car looks well or not, although judging by the amount of material and labor expended on the stenciling of freight cars with various advertisements and other lettering, railway officers are not wholly indifferent to the appearance of their freight cars. There can be no question, however, that the preservation of wooden cars from decay and of steel cars from corrosion is a matter of vital importance to the railway companies. Admittedly the service to which a freight car is subjected is exceedingly severe on paint, but this merely means that frequent repainting is essential to preserve the car. The cost of painting a freight car is so small compared with the value of the material preserved thereby that to economize in paint is an extreme example of saving at the spigot to waste at the bunghole.

It would be a safe guess that a million dollars' worth of paint applied to the freight cars which most need it this season would save ten million dollars' loss in decay and corrosion which will otherwise occur and the amount may easily be thirty millions or fifty millions.

One difficulty in keeping freight cars painted is that freight cars are wanderers, and they never are thoroughly repainted unless they are sent to the shop for general repairs; and as long as a freight car is in demand for use it is considered too costly to take it out of service and send it to the shop merely for painting.

Probably the best way to meet this difficulty would be to establish yard painting outfits to operate in large yards, especially those where idle cars are stored, during the spring and summer months. With a little heed to the weather, nearly as good work might be done in this way as in the shop, and with no expense whatever for movement of the car.

It is worth noting in this connection that the value of freight-car rolling stock should be measured not by its original cost, but by what it will cost to replace it. The probabilities are that an increase in the cost of lumber will make the wooden box-car of the future much more costly than the present box-car. It is therefore all the more important to properly care for the wooden cars now in service.

The Precast Concrete Pile

The precast and weight-driven concrete pile is now such a necessity in the construction of foundations that engineers ar apt to forget how recent a development such a pile is and with what hesitancy its introduction was accepted. It is only a few years since such a pile was only an innovation frowned upon by conservative builders, who feared, not without reason, that the repeated shocks of a heavy hammer must of necessity shatter so slender a concrete column or, at least, destroy that bond between the concrete and steel which confers the sometimes necessary columnar strength to the loaded pile. To allay these fears, ingenious inventors devised different types of cast-in-place concrete piles in the construction of which no shock came upon the structure of the pile. A few of them have proved very successful and are in extensive and ever increasing use. At the same time they are not applicable to certain kinds of work, particularly in subaqueous foundations, and the precast pile has been continuously tried until there is little doubt as to its usefulness under many and varied conditions.

The continuous use of the precast pile has pretty thoroughly allayed the once-held fears as to its integrity under the blow of the hammer. While there have not been reported many cases where driven piles were exposed or withdrawn, the few tests available have shown that the concrete pile withstands the shock of driving remarkably well and that, when well made, and when not obstructed by some impenetrable stratum or individual boulder which is driven against for a number of blows after refusal, the concrete column of the pile can be counted on to be intact throughout its length, which is one of the important requirements in a foundation pile.

In another respect the precast concrete pile is of advantage and that is the extreme length to which it can be successfully driven. The piles used in the Havana piers, described on the first page of this issue, were some of them 80 ft. long and in similar work at Halifax, reported in these columns some weeks ago, piles only a few feet

shorter were employed. In marine work where the pile extends through water many feet above bottom a necessary penetration requires a pile length often far in excess of the economical production of wooden piles, even in places where a wooden substructure is allowable, and the possibility of making and using concrete piles for such lengths solves a number of heretofore complicated problems in pier and wharf work. The main difficulty in such piles is the danger in handling them and this is avoided, as noted in the Havana work, by designing the reinforcement to care for the stresses induced by a certain method of suspension and then providing hooks or rings so that the pile cannot be suspended in any other manner.

Unfortunately, there is nothing in the precast concrete pile that relieves the uncertainty as to safe loading common to all piles. For wooden piles, numerous formulas have been devised, theoretically designed to deduce a safe loading from the behavior of the pile under driving, but such formulas have a value largely dependent upon empirical coefficients which individual engineers develop through experience. Such experience has not been sufficient to warrant the application of proper coefficients to concrete piles, though it has been enough to prove that the coefficients common to wooden piles will not hold for the heavier concrete pile. It seems hardly possible that any formula for driving can be devised which will cover all kinds of concrete piles in all kinds of ground, so it remains a fact for concrete pile work, as really it should be for wooden pile work, that no loading assumption should be made without a satisfactory and fairly extensive loading test of typical piles in typical ground under typical conditions of driving.

A Novel Water-Filtration Plant for Toronto

It is not often that a city takes up a novelty in water filtration or in any other class of engineering work on so large a scale as the proposed 72,000-U. S.-gal. "drifting-sand" filtration plant for which the city council of Toronto awarded the contract on June 8. It is true, as stated elsewhere in this issue, that two plants of a few hundred thousand gallons capacity are already in operation elsewhere and that contracts for two other and much larger plants are well under way. It is also true that a working unit was tested for 33 days at Toronto under the direction of the local medical officer of health and city analyst, and that this same test plant has been under observation for over a year. Nevertheless, the fact remains that the drifting-sand filter is as yet in the working-scale experimental stage, with few data yet available regarding its efficiency and less to be had regarding operating costs.

The drifting-sand filter may be described as a deep mechanical filter with reversion to the early type in the way of absence of coagulation basins and rate-controllers and with the addition of continuous washing and replacing of filter sand. It is claimed that this added feature makes up for the lack of a coagulating basin. To what extent this claim will be made good by experience at Toronto and on different waters at other places, it will be interesting to learn a few years hence.

Those who have followed the history of mechanical filtration will remember that the basic patent for the process was upheld very largely on the claim that the process obviated all need for precoagulation, but that as the years have gone by precoagulation has come to be regarded as more and more essential. In much the same way, new types of sewage filters, at first held to be all-sufficient, have been found by experience to yield a better effluent at less cost when pretreatment and in some cases after-treatment was employed. In other words, up to this time a vast body of experience has proved that as a rule some lightening of the burden on both water and sewage filters is desirable. The broadest exception to this rule is when water filters, and particularly slow sand filters, treat relatively clear and colorless water. In so far as the Toronto water falls in this class precoagulation may be unnecessary, even for mechanical filters. As has already been stated, it is claimed for the drifting-sand filter that precoagulation is not required.

The foregoing illustrations do not prove and are not intended to prove that the drifting-sand filter is not going to be a great advance in filtration. They do raise questions as to its rendering precoagulation unnecessary, and to the experienced will suggest various other questions regarding these filters which must yet be settled.

A city less venturesome than Toronto would probably have deferred awarding so large a contract for a new type of filter until it had been tested under the direction of consulting engineers. Such tests might well have included the standard type of mechanical filter, operated with and without precoagulation, and they might also have included slow sand filters, the whole dealing with the same raw water. As events have proven, no time need have been lost by the more comprehensive tests, since over a year has gone by since the tests an the drifting-sand filters were begun.

However, the city authorities of Toronto did not adopt the new filters until after a test under the direction of local officials and a long period of observation. They have the assurance that the engineering details of the proposed plant have been worked out with great care by the engineers mentioned elsewhere in this issue.

Other cities will have reason to thank Toronto for having the courage of its convictions to the extent of constructing a large example of this new and interesting type of water filtration plant.

"Safety Legislation" Which Produces Danger

It has been many times pointed out in the columns of ENGINEERING NEWS that the present tendency of Congress and of State legislatures to pass upon all sorts of technical questions without the aid of expert advice is fraught with great danger. A remarkable illustration of this has just been furnished by a report made last week by a committee of the American Railway Master Mechanics Association on locomotive headlights.

The ordinary locomotive headlight, consisting of an oil lamp with its flame in the focus of a brightly polished parabolic reflector, has been for many years a distinctive feature of American railway practice. In Europe, the locomotive headlight is considered of comparatively little importance. The obvious reason is that European railways are almost universally fenced and protected from trespassers and the locomotive runner devotes himself chiefly to observing the signal lights ahead and does not

expect to watch every foot of the track as it comes in view as does an American locomotive runner.

A dozen years or so ago, an ingenious inventor thought he could make a great improvement upon the locomotive headlight by substituting for the ordinary oil lamp an electric arc light of 1000 to 1500 candlepower. With the parabolic reflector behind it, this produces a beam of extraordinary intensity. The electric locomotive headlight at once achieved a considerable degree of popularity, especially on railways operated in sparsely settled sections of the West. Railway officers responsible for the safety of operation on lines of heavy traffic, however, found that the white rays of the electric headlight were so powerful that the engine runner in the cab could not tell the color of the signal lamps as he passed them; also that the powerful rays from the light temporarily blinded enginemen running trains on the opposite track.

It was found to be necessary where electric headlights were used, therefore, to require the light to be switched off in running through yards. On the other hand, the headlight admittedly had some valuable safety features and has, perhaps, in some cases, prevented accidents. It is said that some butting collisions have been prevented by the engine runners of opposing trains seeing each other's headlights when a long distance apart. The back flagman of a train, also, is spurred to greater energy if he can see the headlight on an approaching locomotive reflected against the clouds perhaps two or three miles away.

On the whole, however, the weight of expert opinion has been against the electric headlight as a safety device. Official tests, made under the direction of some of the state railroad commissions, have proved that these headlights were very apt to lead to confusion in reading signals.

In order to settle finally this disputed question a special committee of the American Master Mechanics Association has been at work for the year past upon a scientific investigation of the whole question of locomotive headlights. This committee, of which D. F. Crawford, of the Pennsylvania R.R., is chairman, submitted its report (a bulky volume of over 300 pages) at the Atlantic City meeting of the Master Mechanics Association last week. To show the thoroughness with which the work of the Commission has been done, it may be stated that an average force of twenty men devoted their entire time to the investigation of the subject covered by this committee during the five months from July 1 to Nov. 30 of last year.

A special laboratory was built in the railway shops at Columbus, 45 ft. long, 30 ft. wide and 20 ft. high with elaborate equipment for making photometer tests of the various headlights. To study the effect of different headlights upon the reading of signals, a special observation locomotive was constructed and dummies were made to represent men standing on the track dressed in uniforms of dark, medium and light cloth. The conclusions of the committee, as a result of these months of investigation and tests, are summarized in the following paragraph:

In order that a locomotive headlight shall be of such intensity as not to cause misreading of signals, obscuring of hand signals, fusees, red lanterns and classification lamps by opposing headlights and be of such intensity as not to temporarily blind the engineman looking into the same, a headlight must have an apparent beam candlepower not greater than 3000, referred to the center of the reference plane, from 500 to 1000 ft. ahead of the locomotive.

This is supplemented by a paragraph which states a minimum power for headlights in order to enable an engineman to readily locate whistle posts, yard limit and crossing signs and similar landmarks while running.

Stripped of technicalities, this means that the electric arc headlight is an apparatus producing danger instead of safety for the average apparent beam candlepower of such lights, according to the tests made by the committee, is from 60,000 to 1,000,000. The conditions laid down by the committee were perfectly satisfied by four different types of oil-lamp headlights and one headlight using acetylene.

There is no imaginable reason why these tests, made by the Master Mechanics Association with great care and at great expense, should not be regarded as absolutely authoritative and final. It must be remembered that the primary responsibility for the safety of railway service rests upon the railway companies' officers. They are far more concerned in the prevention of railway accidents than are any state legislators or congressmen. Their own reputations and not seldom their own lives are at stake in securing such safety. Further, they are dealing with the matter of safe methods of railway operation day in and day out the year round, whereas your congressman or your legislator, or even the average member of a state railway commission, takes up all these questions *de novo* as one small incident in a few months or a year or two's service, during which this is only one out of hundreds of matters upon which he has to pass.

It ought to be clear enough, therefore, without further argument that the question what sort of a locomotive headlight produces the greatest safety in train operation is a technical question for railway experts to pass judgment upon and not by any means one that can safely be entrusted to the average state legislator.

When we turn to the statute books of the various states, however, we find that in conformity to the prevalent craze for regulating by law everything in connection with the operation of railways and other public utilities, a number of states have already enacted laws compelling railways, under severe penalties, to use electric headlights. An appendix to the committee's report contains a digest of these state laws on locomotive headlights.

It appears that the following states have passed laws requiring electric headlights to be used: Arizona, Missouri, Georgia, Mississippi, Colorado, North Dakota, Minnesota, Montana, Nevada, North Carolina, Oklahoma, South Dakota, Texas, Arkansas, Florida. A number of other states have passed laws fixing, not the kind or candlepower of the headlight directly, but laws requiring that the headlight shall be sufficient to enable the locomotive runner to distinguish an object the size of a man at a certain distance ahead.

It is noteworthy that the list of states which have taken pains to pass detail laws upon this matter of locomotive headlights is made up mostly of the states of minor importance. It is a question which arouses curiosity at least as to why all these state legislatures should have been so energetic as to pass laws upon this subject. It is certainly no more important than a hundred other matters in connection with the details of railway operation. It would be extremely interesting if the Interstate Commerce Commission in its zeal for investigation could undertake to investigate what was the accelerating motive which produced this widespread state legislation on the

question of locomotive headlights and whether the enterprising manufacturers of electric headlights were instrumental in procuring the acceleration.

Let it not be thought that this is a trifling or unimportant matter. The committee's report before us quotes records of fatal accidents reported by the Interstate Commerce Commission itself in which the cause was traced to the misreading of signals due to the use of electric headlights. It quotes the authority of numerous railway-train employees and railway officers as to the dangerous conditions resulting from the use of electric headlights. Congress has seen fit in its wisdom to pass legislation creating a national bureau for the inspection of locomotive boilers under the direction of the Interstate Commerce Commission, involving a great annual outlay. It is quite probable, however, that the accidents due to the use of electric headlights cause greater casualties to life and limb at the present time than all the casualties caused by locomotive boiler explosions. Certainly, the possibilities of accident are greater.

The ultimate authority in railway operation today is not the managers of the railways, but the national congress and the state legislatures. Does the public desire to have the safety of railroad travel guarded by the expert care of responsible railway officers, or does it prefer to travel on trains which are run in accordance with safety legislation enacted through the efforts of manufacturers who have a financial interest in alleged safety appliances? The locomotive headlight situation puts this issue squarely up to the American people.

Letters to the Editor

Lugs on Wood Paving Blocks as a Preventive of "Blow-Ups"

Sir—As noted in the editorial in ENGINEERING NEWS, May 14, 1914, on "Guarding against Expansion in Wood-block paving," one of the big problems confronting the engineer is how to eliminate the danger of bulging and heaving in a creosoted wood-block pavement.

Many suggestions have been made as to the best method of doing away with this trouble. In the letters published in the issue of June 4, 1914, it was suggested that whenever possible the blocks be delivered on the work while still hot; that a pitch filler be used; again that a cement grout filler be used, and that the blocks be laid on a smooth concrete base. These various and somewhat contradictory suggestions show very plainly the indirect methods that are used to overcome this expansion.

From the various experiments that have been conducted and from installations of creosoted wood-block pavements that have been laid, the writer feels positive that in order to effectually solve this problem, some direct method of taking care of expansion must be followed. It is perfectly natural that under certain atmospheric conditions, expansion of the paving blocks will take place. In order to nullify the effects of this expansion, proper allowance must be made for it. The blocks may either be laid with a ⅛-in. joint on each side of the block or a block having lugs on the side and end must be used.

The lug block is a practical form of construction, as they are easily laid with a uniform joint, while each block has a firm bearing on those adjacent. As the blocks expand the lugs compress, allowing the pavement to retain a smooth compact surface.

The lugs on the ends of our "Kreolite" blocks are $\frac{3}{16}$ in. deep, those on the side ⅛ in. deep. All lugs extend the full depth of the block and are an integral part of same. The spaces provided by the lugs allow the filler, either sand or pitch, to get down between the blocks where needed rather than remain on top of the block.

The first lug-block pavements were laid in the early part of 1912, and since that time thousands of yards of this type of paving have been laid in different parts of the country. Some of these pavements were laid with sand filler, some with pitch filler. The bedding under the blocks was dry sand, cement grout, or smooth concrete; yet in all these installations no trouble was had from the expansion of the block. Many city engineers have advised the writer that in their opinion the placing of lugs on creosoted wood block was the only effectual, practical manner of doing away with troublesome expansion.

W. E. WRIGHT,
The Jennison-Wright Co.

Toledo, Ohio, June 15, 1914.

Water-Hammer and Hydrant Design

Sir—The editorial in your issue of Apr. 30, referring to the requirements of the specifications of the American and New England Water-Works Associations for the control of water-hammer in hydrants and valves, brings up the question as to whether two bodies of able engineers should evade this problem and put the responsibility for varying and generally unknown conditions on the manufacturer, or whether they should cover the requirements as clearly as their knowledge will permit and accept the results.

The latter course is the fair one, and the one which should lead to the best results, as there should be no question, between the engineers and the manufacturers, as to who is best fitted to assume the responsibility and to whom this really belongs. This would lead to more uniform equipment and more economical production, and would permit manufacturers to enter the field who, otherwise, could not do so.

Assuming that the use of the word "extraordinary" in the latter specification is unintentional and that "ordinary" is meant, the two cover about the same ground, except that the former permits greater ram pressures under the higher heads, which is proper. Although the for-

mer gives a hint as to preventive measures, neither helps the manufacturer to decide what he shall figure on in any given case. He would have to thoroughly understand a subject which is not at all clearly explained in available technical literature, and to know all the complicated conditions which might surround each one of his hydrants when installed, and to use his judgment as to what constitutes ordinary or proper use.

When confronted with such a problem, he will, if he wants the work and must meet competitive bids, put in his standard equipment and "take a chance" on the result. The specifications will have served no purpose in preventing trouble, but can be made the basis of much disagreement after installation.

The conditions which will affect the water-hammer are the velocity of the water, the degree of rigidity of the pipe, the rate of valve closing and the distance to the first adequate relief, whether it be a reservoir or a large pipe. It is suggested that, by properly proportioning the valve area to the number of outlets and by agreeing upon a maximum distance to the first adequate relief, a definite pitch for the screw could be arrived at. As the greater velocity, which accompanies higher pressure, will usually occur in conjunction with a heavier pipe, the resultant higher ram pressure will not be so dangerous as it might be otherwise. This idea was evidently in mind when the American specifications were agreed upon

The point to be emphasized is that the engineers should assume responsibility for this feature of hydrant design and give the manufacturer the benefit of their knowledge, rather than force him to answer for conditions over which he has no control and which will, usually, be difficult for him to ascertain. As they now stand the specifications, in respect to water-hammer, do nothing but shift the responsibility where it does not belong.

Not being interested in the manufacture of hydrants or valves, I feel free to make these remarks.

S. L. Berry.

317 Rialto Building, San Francisco, Calif.,
June 1, 1914.

NOTES AND QUERIES

On p. 1339 of last week's issue the article on the large roof truss for the Eighth Coast Artillery at New York City incorrectly stated that the roof is 520 ft. long and that the number of arches is 40. There are 28 arches and the distance center to center of end trusses is 590 ft.

Interesting Features in the New Pittsburgh Paving Specifications

The new standard specifications of the Bureau of Engineering, Department of Public Works, Pittsburgh, Penn., contain a number of new and interesting features, a few of the more important of which are here noted.

Asphalt Pavements—It was found by cutting and testing disks cut from existing asphalt pavements that the present wearing coats showed a high absorption. Under the new specifications more fine aggregate is required: portland cement or stone dust passing a No. 200 sieve, 10 to 15%; sand passing a No. 80 and retained on a No. 200 sieve, 18 to 36%; sand passing a No. 40 and retained on a No. 80 sieve, 20 to 50%; sand passing a No. 10 and retained on a No. 40 sieve, 8 to 25%, and sand passing a No. 4 sieve up to 5%, are now specified for the 1½-in. wearing coat. This will require the importation of some fine lake sand. The amount of bitumen required in the wearing coat is 10 to 13.5%.

Concrete Pavements—One-course concrete pavements with a 1-in. sheeting course of sand will be tried in alleys. The concrete is mixed in the proportions of one part cement, two parts sand and three parts of broken stone or gravel, and the surface is struck off with a template having metal edges, and is finished with a wooden float. Expansion joints ¼ to ⅜ in. filled with a bituminous material are required along each curb and transverse expansion joints every 30 ft. longitudinally, unless otherwise specified. The transverse joints are protected with soft metal plates not less than 2½ in. deep and between ⅛ and ¼ in. in thickness. The thickness of the pavement is to vary with the location; reinforcement is to be used when required. All concrete pavements are laid under a one-year guaranty.

Wood-Block Pavements—The specifications for creosoted wood block provide for a treatment of 16 lb. of oil per cu.ft., and a light oil is preferred; the preservative must be completely liquid at 38° C., and of a specific gravity at that temperature of not less than 1.03 nor more than 1.08. As tight joints as possible are required. Expansion joints filled with bituminous material ¾ to 1 in. wide are required along each curb.

Brick Pavements—Brick pavements may be constructed of wire-cut-lug bricks, which have hitherto been prohibited; only brick with raised lugs on one side not to exceed ¼ in. in height can be used, and the side of the brick opposite the lugs and the two ends must be provided with a suitable groove placed in the center. Either bituminous filler or portland cement grout may be used for the joints; up to this time no cement-grouted brick or granite-block pavements existed in Pittsburgh.

Granite Blocks—The specifications for granite-block pavements reduce the depth of blocks from 7 in. to between 5 and 5½ in., and provide for not more than ½-in. joints. The joint filler may be either bituminous material or portland-cement grout, as provided for brick pavements.

Concrete Sidewalks—Concrete sidewalks are required to be laid in one course, of a 1:2:4 broken stone or gravel mix, 5 in. in thickness, laid on a 5-in. foundation of broken stone or gravel. Surfacing is to be done by floating so as to leave a moderately rough surface; troweling is expressly prohibited. The application of neat cement to hasten hardening is prohibited. Expansion joints ⅜ in. wide are required every 50 ft., and extend the full width and depth of the slab. These joints are filled with bituminous joint filler or approved strip filler. All concrete sidewalks thus laid are under a one-year guaranty.

A 5280-Ft. Building of Corkscrew Shape—The New York "Evening Post" prints the following dispatch dated May 28, from Los Angeles, Calif.:

Charged with defrauding working people by selling stock in an alleged fictitious amusement building outside the grounds of the Panama-Pacific Exposition at San Francisco, C. H. Knight today is in the county jail in default of bail, to await trial in the Superior Court.

Two stockholders testified that Knight had shown them pictures of the projected building, which was to be a mile in height and built in the shape of a corkscrew.

Fall of a 312-ft. Timber Combination Bridge

A 312-ft. combination timber and steel highway bridge of the Pratt truss type, which spanned the Yamhill River at the village of Dayton, Ore., collapsed on May 25, 1914, about 4 a.m. No one was on the bridge at the time of the fall and no injuries resulted. It is believed that an automobile crossed the bridge at rather high speed an hour or so before the accident. The bridge was nearly 25 years old, but many of its timber members had been renewed; outside of this it does not appear to have had much maintenance supervision.

posts, floor members, and top-chord bracing, were all of Oregon fir, the sizes ranging from 14x14 (top chord and end posts) to 6x8 (portal bracing and top-chord diagonals). The bottom chord consisted of eye-bars, in sizes up to 5x1 in., connected by 4-in. pins at the panel-points. The main diagonals were nonadjustable bars, and the counters (used in all panels) were bars with turnbuckles. The bottom-chord diagonals also were turnbuckle rods, as were also the transverse ties of the portals.

The span of 312 ft. c. to c. of pier was divided into 16 panels of 19½ ft.

Each end of the bridge rested on a two-post pier formed by two 44-in. steel cylinders filled with concrete,

FIGS. 1-3. YAMHILL RIVER BRIDGE BEFORE AND AFTER

(Upper) A view taken some years ago; looking upstream. (Lower left) Looking toward north end, the day after the collapse of May 25, 1914. (Lower right) Another aspect of the wreckage, photographed the same day as Fig. 2.

Factors in the failure were: (1) decayed timber; (2) a cylinder-pier foundation of doubtful character when new (each of the four cylinders supporting the bridge was supported on a single pile) and weakened by decay of the piles; and (3) probably also changes in the bridge due either to settling of the supports or to deformation of the truss work as indicated by slackness of some of the tension rods. The most probable guess as to the cause of the failure is that the cylinder pier supporting the north end of the bridge fell over, which may have crumpled the bridge together longitudinally, as well as dropped it.

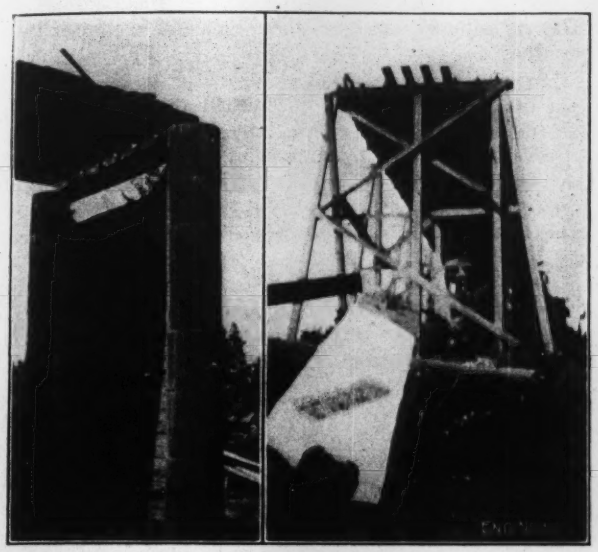
Fig. 1 is a view of the bridge taken two or three years ago. It shows the type of the structure fully enough so that the construction can be thoroughly understood with the aid of the following explanation. The top chord,

the cylinders resting on the natural earth about 3 ft. below ground level. Under each cylinder a single pile had been driven. This projected up a short distance into the concrete filling of the cylinder.

The Yamhill River at the point of crossing is a sluggish stream about 150 ft. wide and at normal stage about 16 ft. deep. It is navigated by small steamboats (the bridge is some 70 ft. above water level). The river banks consist of some 20 ft. of sandy loam on hardpan, the latter showing at the water's edge. The location of the bridge is at the end of the main street of Dayton, a village of about 700, on the south bank of the river. The railway station is north of the river, and thus the bridge carried all traffic between village and station. In addition, it is on the main road from Portland to towns on

the west side of the Upper Willamette Valley, and carried a heavy automobile traffic.

The bridge was built for the county in the spring of 1890, by contract. Its cost is said to have been $15,000.



(Fig. 4. The south pier, not disturbed. Fig. 5. A cylinder of the north pier, with bridge timbers lying on top.)

CYLINDER PIERS OF THE YAMHILL RIVER BRIDGE

The original contract, specifications and plans are not on record, and no information was obtainable as to inspections made during the life of the structure. It is stated, however, that in 1904 all the timber members of the bridge were renewed, under contract, and again in 1913 the floor-beams were renewed. The citizens of Dayton have considered the bridge unsafe for some time, although it had not been condemned. Persons who had occasion to cross the bridge frequently report that it swayed violently even when a single person walked across; that the tension rods were slack; that one of the upper struts at one time fell to the floor; and that the camber was out of the bridge. The latter, however, is disputed by the county authorities.

THE FALL OF THE BRIDGE

Some fishermen camped near the bridge on the night of the failure report hearing an automobile cross the structure rapidly. Then, they say, the bridge began to creak, the noise continuing for nearly an hour until the collapse at 4 a.m. No one saw the bridge fall. The wreck was complete (see Figs. 2 and 3).

The supporting pier at the south end of the bridge is intact, but the north pier fell. Some of the timbers of the bridge are lying on the cylinders of the pier in its fallen position, which seems to indicate that the pier fell first. The bridge itself dropped nearly vertically, moving possibly 5 ft. upstream.

While the steel members of the bridge had not been painted, to all appearances, since first erected, they were in fairly good condition, except that one of the eye-bars was found broken. As part of this break was old and as the other bar of the pair was not broken, it would seem that the defective condition of this one bar was not responsible for the wreck. The timbers, however, exhibit serious decay in many places. The ends of some of the 12x12 posts were in bad condition, and the lower end of one of the 14x14 end posts which rested in the casting on the north downstream cylinder was so badly decayed that not more than 6 or 8 in. of solid wood remained (see Fig. 8).

The top chord, though roofed with tin, did not escape decay, as evidenced by Fig. 9.

The 12-in. piles under the cylinders were rotted about half way through. Figs. 6 and 7 bring this out, though not clearly.

It is probable that the bridge will be replaced by a 200-ft. steel span, this length being sufficient for all waterway requirements for the present. The bridge traffic is being taken care of by a ferryboat.

W. W. Amburn, Civil Engineer, McMinnville, Ore., who gathered the above data, adds some pertinent comment:

To an engineer looking over the ground now it is hard to understand why a 312-ft. span was used when a 200-ft. span would have been ample. Neither can he understand why a better foundation was not secured with hardpan showing at the water's edge. No doubt the county saved an engineer's fee by letting the contractor do his own engineering and inspecting. Some of the lessons we in Oregon could learn with profit from this fortunate bridge failure are:

(Fig. 6. West pile of north pier. Fig. 7. Foot of end post at north end of bridge, with 5-in. knife-blade stuck into the decayed wood. Fig. 8. East pile of north pier. Fig. 9. End of 14x14-in. top chord, with tin roof.)

DECAYED TIMBERS OF YAMHILL RIVER BRIDGE

(1) That planning and supervision of the construction of highway bridges should be in the hands of a competent engineer.

(2) That inspection and care of highway bridges should be in the hands of an engineer.

(3) That records of contracts, plans and specifications should be preserved by the public authorities.

It would seem that all these objects could be best secured by the appointment of a county engineer in place of leaving the duties of such an official in the hands of the County Court and County Commissioners who make no claim of fitness for the work.

A Large Elevated Water Tank at St. Thomas, Ont.

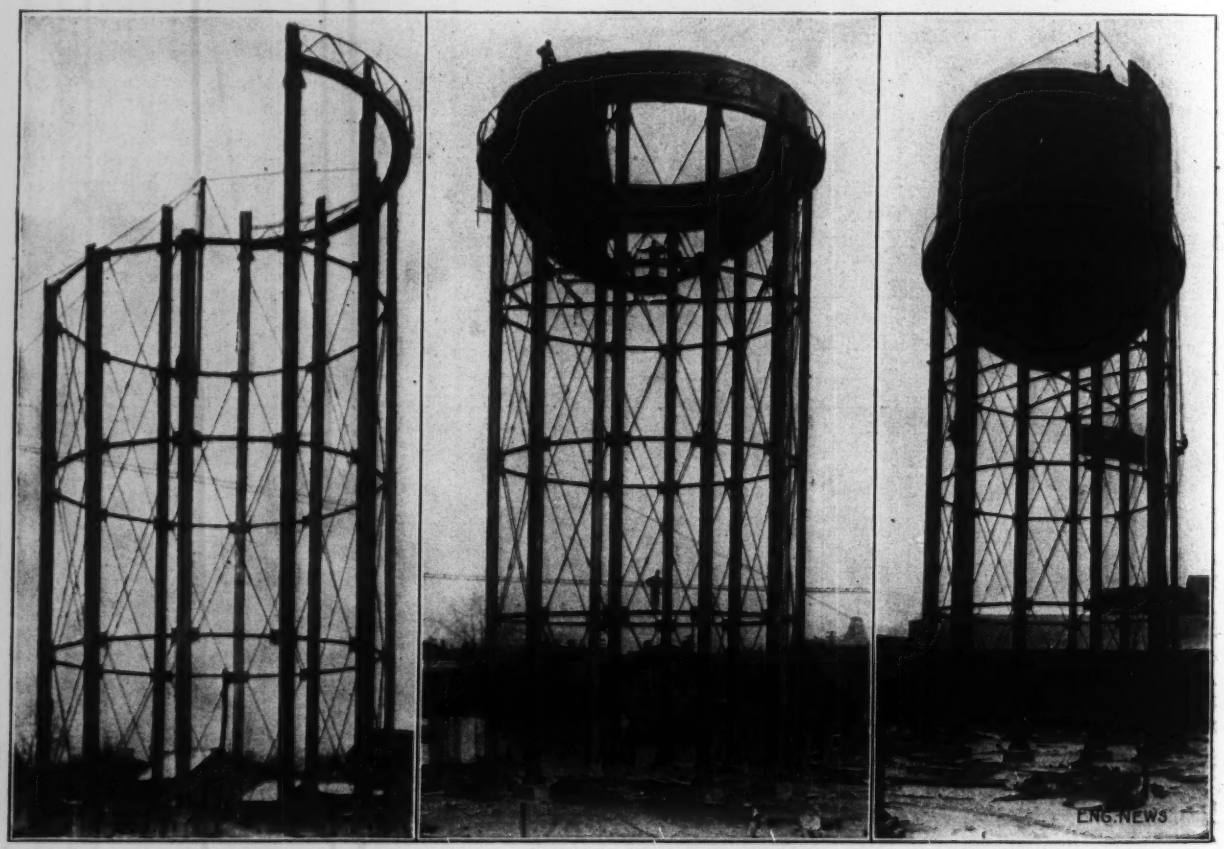
An elevated water tank with a capacity of 500,000 Imp. or 600,000 U. S. gal. was recently completed at St. Thomas, Ont. Three interesting construction views and a view showing the completed tank are reproduced herewith. The tank is 46 ft. in diameter and 37 ft. 3¾ in. high, and the distance to its top is 131 ft. 2¾ in. The tank gives a range of pressure of from 35 to 56 lb. throughout the city.

The twelve posts making up the tower are of a built-up section, consisting of two 15-in. channels weighing 50 lb. per ft., with one cover-plate which varies in thickness from $\frac{3}{8}$ at the bottom to $\frac{7}{16}$ in. at the top. The columns are laced on the other side which makes a section which may be readily painted at any time.

The horizontal members of the tower are made of two 6-in. channels weighing 8 lb. per ft. The rod bracing between columns varies from 1¾-in. rods at the top to [illegible] in. rods in the bottom panel. A heavy system of [illegible] bracing is provided at each strut level to keep the vertical tower rigid under wind pressure. Clamps placed about the wooden frost casing of the inlet and outlet pipes take the stresses from these rods and in no way distort the frost case.

The tank itself is made of ½-in. plate in the lower part of the cylinder and diminished to ¼-in. plate at the top. The bottom of the tank is made with double lap-riveted joints, the metal being ⅜ in. thick at the connection to the cylinder and $\frac{7}{16}$ in. thick at the extreme bottom. At the connection of the posts to the tank a heavy structural steel balcony or walkway is provided, which is 2½ ft. wide, of ¼-in. plate and has 6x4½-in. and 4x3x$\frac{5}{16}$-in. angle stiffeners.

The bottom of this tank is made to a special curvature, which is used exclusively by the firm manufacturing this structure. The bottom, in section, is a three-centered curve which connects to the vertical cylinder on a tangent to this curve. In this design there is no other stress transmitted to the cylinder than in the commonly used hemispherical design. The advantage of this bottom is that it is more shallow than a full hemisphere, its total depth being 18 ft. 2 in., while the hemisphere would be nearly 5 ft. deeper. This particular curve is selected because it gives the greatest capacity for the amount of steel used and reduces the stresses in the bottom to a minimum. Furthermore, it gives sufficient slope to the bot-



CONSTRUCTION VIEWS OF ELEVATED WATER TANK, ST. THOMAS, ONT.

(1) Supporting tower nearly completed. (2) Curved first ring of plates completed and curved bottom being placed. (3) Erecting the fifth ring of plates.

tom so no sediment will remain in the tank. This type of bottom is used very extensively in railroad work, for which it has been adopted as standard by several of the largest companies.

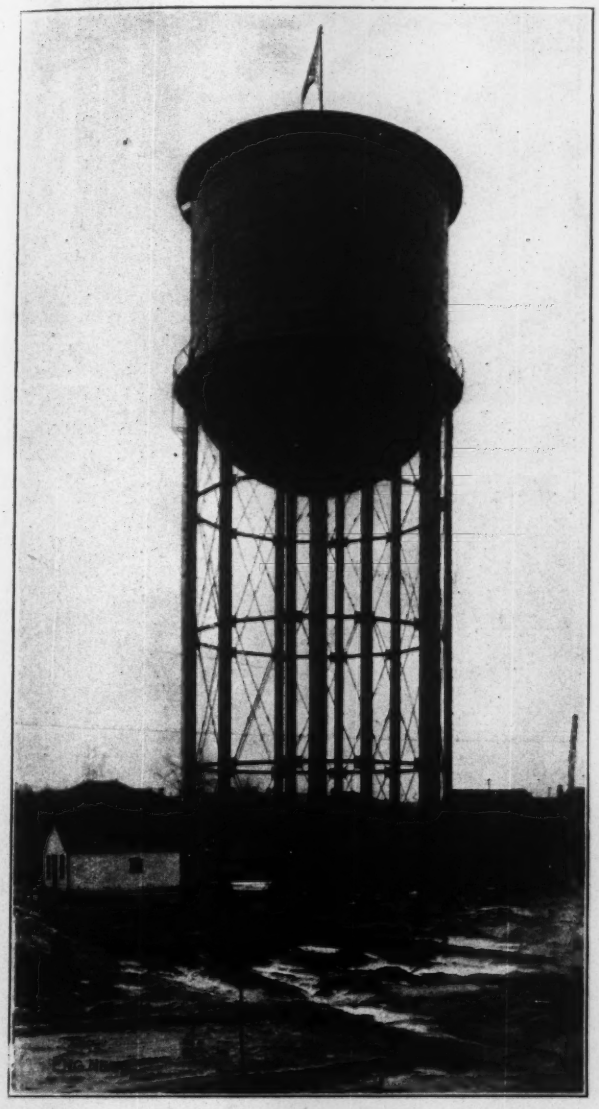


FIG. 4. A 600,000-GAL. U. S. WATER TANK, ST. THOMAS, ONT.

(Diameter of tank, 46 ft.; height, 37 ft. 3¾ in. Height of top of tank, 131 ft. 2¾ in.)

The roof of the tank is made of ⅛-in. steel plates, riveted and calked water-tight. The roof is supported on 24 steel rafters which rivet rigidly to the tank shell. The roof projects beyond the tank far enough to carry all rain water well beyond the balcony.

Each of the columns supporting this tank is anchored by means of two 1¼-in. bolts to a massive block of concrete. The footings are 5 ft. square at the top and extend down 4 ft. 9 in., where they are 11½ ft. wide by 13½ ft. long. Each foundation is surmounted by a finished block of rich concrete, 4 ft. square, which gives a neat appearance to the piers.

The inlet and outlet pipe is of standard weight 14-in. cast-iron pipe, protected from freezing by a wooden frost jacket having four thicknesses of lumber and building felt. The tank is kept full at all times by the use of a Golden-Anderson controlling altitude valve on the 14-in. inlet line. This valve may be opened at any time from the pumping station by means of an electrical attachment provided by the manufacturers for use with this type of valve.

Ready access to all parts of the structure is provided by means of a substantial separate steel ladder. From the balcony, a second ladder reaches to the top of the cylinder. It is on a trolley which permits it to revolve around the entire tank. A third ladder is fastened to the heavy cast-iron finial at the apex of the roof, and revolves completely around the roof. This complete system of ladders makes repainting a very simple matter, and permits of thorough inspection of the tank and tower at any time.

The requirements of the water system of the city of St. Thomas were determined by the Board and incorporated by M. Ferguson, City Engineer, in a specification. This specification was given to recognized competent manufacturers of elevated-steel tanks and bids were considered on the manufacturers' plans in accordance with the city's specifications. Handling the business in this manner gave the city a practical design and one which could be built at the lowest price consistent with perfect workmanship. The complete water tower, exclusive of foundations, was built for about $27,000.

The design was submitted by the Pittsburgh-Des Moines Steel Co., of Pittsburgh, Penn., who manufactured and erected the structure with its company forces. All designs and detail drawings were approved by Mr. Ferguson before work was begun. We are indebted to the company just named for the foregoing description of the tank and for the accompanying views.

Winner of the Chilean Railway-Shop Competition—On May 1, 1914, the Chilean Government announced that the Niles-Bement-Pond Co., of New York City, had won the first prize of $20,000, offered Feb. 23, 1913, for plans and specifications of a central model workshop and four repair shops for the state railways of Chili. There were eight competitors in all: Two Chilean, one Portuguese, three German, and two Americans. A second prize of $10,000 was awarded to one of the Chilean firms. The other American competitor was George E. Nolan, San Francisco, Calif.

The fundamental requirements of the central workshop were as follows:

A capacity for repairing 500 locomotives with tenders per year. Capacity for the simultaneous and the continuous repair of 50 passenger coaches and 400 freight cars. The present number of locomotives in operation is 600; number of passenger coaches, 500; freight cars, 6000, these figures to be increased every year as follows: Coaches and cars, 10%; locomotives, 5%. Provisions must be made for producing necessary parts such as cylinders, boilers, mechanisms, etc.

The Niles-Bement-Pond Co. assigned two of their men to the work of collecting and arranging photographs, descriptions, drawings and prices. The final specifications filled six large volumes bound in morocco leather. The time required for this work was about eight months. The specifications contained a photograph and description of every machine and piece of apparatus. The photograph is placed on the left page, the description on the right, so that they face each other. Where possible a choice of methods as regards roofing, flooring, etc., was offered. All the text, including dimensions and notes on drawings, were in Spanish. Prices were furnished for each department of the shops. The total estimated cost was around three millions dollars.

No official announcement has been made regarding the actual construction work on these shops. The awards were only for the plans and specifications.

Reinforcing Building Footings Already in Place

The new plant of the Galveston Cotton Compress & Warehouse Co., at Galveston, Tex., covers an area of 425x1070 ft., approximately 375,000 sq.ft. of floor area, including the fire lanes between the numerous buildings. The various buildings making up the plant are one-story structures of very simple design, consisting only of flat or sawtoothed roofs resting on beams which span columns symmetrically placed on prismatic footings. The buildings are all of unit reinforced-concrete construction designed and built by the Unit Construction Co., of St.

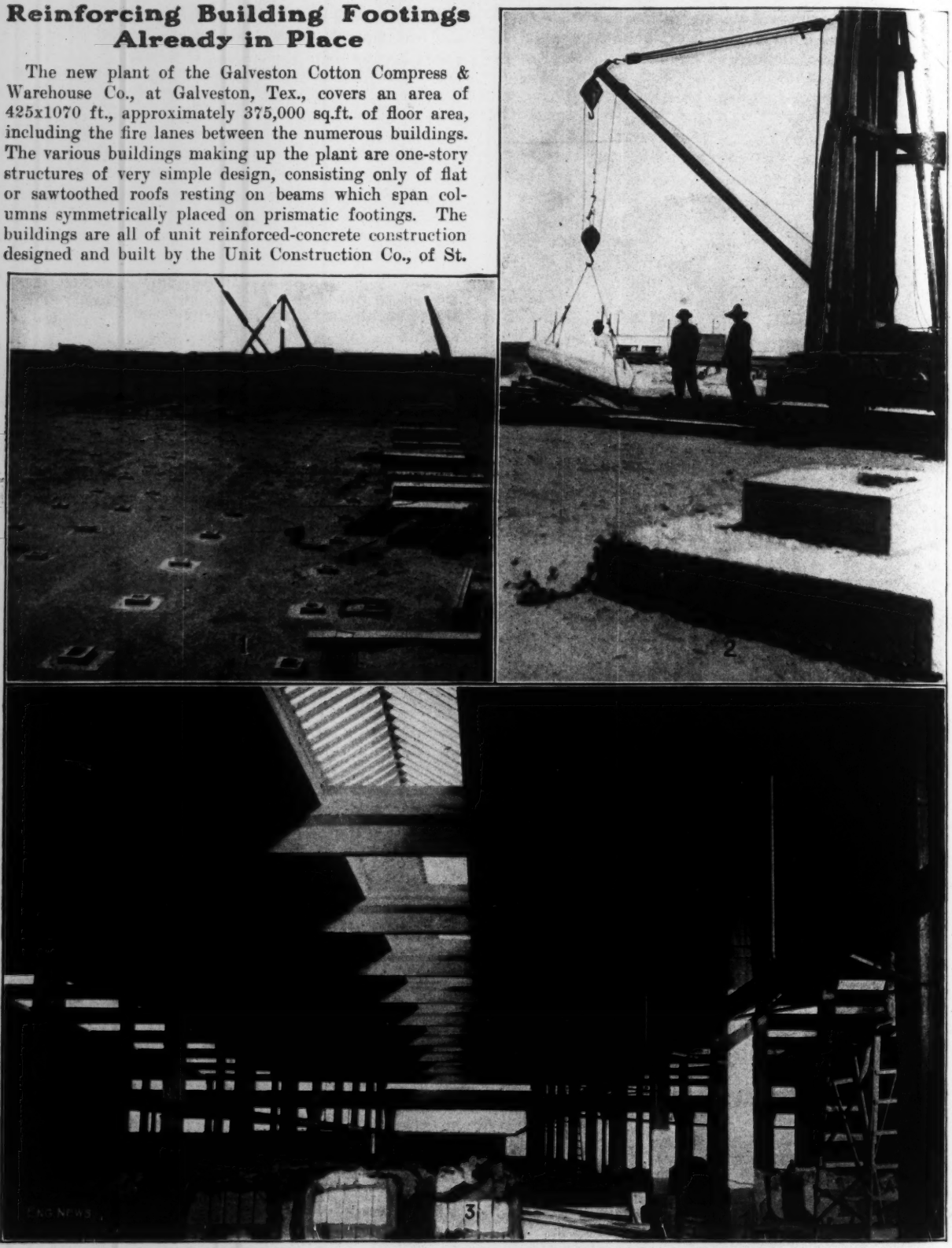


FIG. 1. FOOTINGS IN PLACE. FIG. 2. MOVING A PREVIOUSLY PLACED FOOTING. FIG. 3. INTERIOR OF ONE OF THE BUILDINGS BUILT BY THE UNIT CONSTRUCTION METHOD

(Precast members joined together at connections; note skylight rafters of precast members.)

Louis. In this system of construction, the prismatic footings are cast in place with proper recesses for the insertion of precast reinforced-concrete columns, which, in turn, are provided with grooves for the placing of the precast curtain-wall slabs, roof slabs and roof girders.

In the construction of the building, a very interesting detail was the reinforcement of the first placed footings, which were found to be not strong enough to carry the load for which they were designed.

The buildings are all founded on that part of the island at Galveston which has been filled in to a depth of from 5 to 10 ft. of fine sand pumped from the ocean. On this sort of material, local experience shows the proper

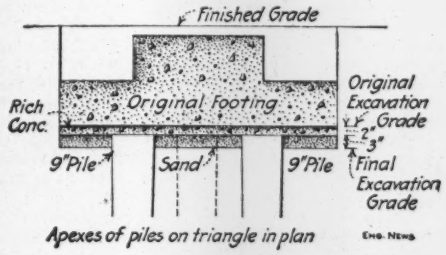


FIG. 4. METHOD OF UNDERPINNING FOOTING

unit pressure to be about 1500 lb. per sq.ft., and the footings are designed for this unit pressure. After the contract was let, and the contractor had inspected the site, doubt was felt as to whether the soil would bear even so small a unit loading, and a test was made on an 18x18-in. base. In this test, the footings settled ¼ in. the first day, but, although it rained continuously for several days thereafter, no farther settlement was noted. Taking this as a conclusive test, the contractor proceeded to the construction of the footings as designed, and some time later commenced the erection on these footings of the present concrete columns.

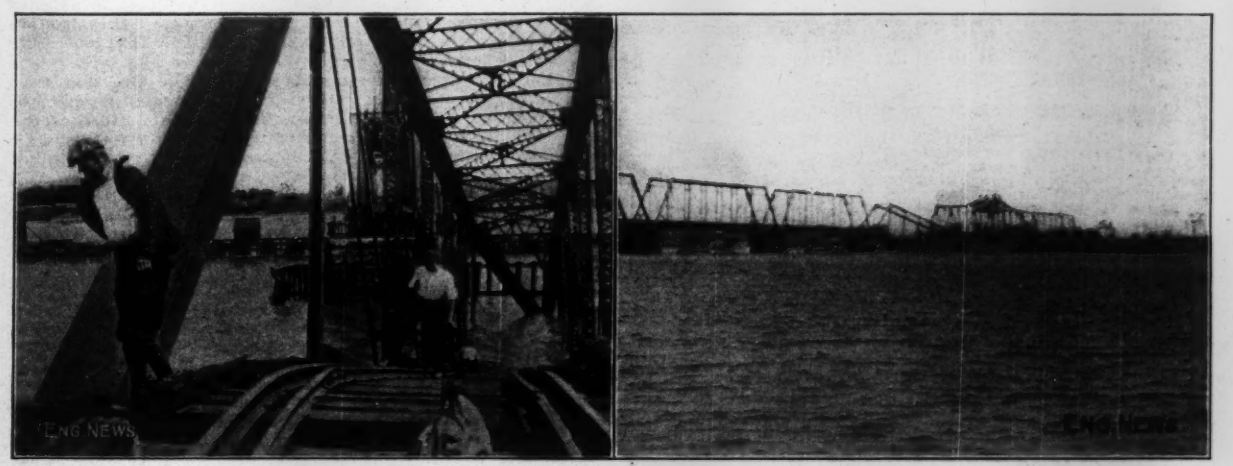
After a portion of the work had been placed, it was found that the footings already in were not only settling, but were shifting sidewise as well. At this time about 420 separate footings had been placed containing 700 cu. yd. of concrete and covering an area of 140x1100 ft. After some study, the procedure outlined below was taken to reinforce these fittings.

The column and wall units, which had been erected, were taken down and stored in piles. The prismatic footings, Fig. 4, were then lifted from their place by a locomotive crane, Fig. 2, and 5 in. additional was excavated below grade, grade being the bottom of the original footing. Under the place to be occupied by the footing, three 9-in. wooden piles were then driven to refusal and sawed off about 3 in. above the newly excavated grade and about 2 in. below the old grade, these three piles forming the apexes of a triangle with sides about 2 ft. 6 in. The next step was to fill in and pack solidly about the heads of the piles enough fine sand to bring the surface level with their tops. On this bed 2 in. of rich concrete was placed, bringing the surface up to the old excavated level.

The displaced footing was then picked up with the crane and set on the bed of new concrete. After being leveled to grade, this formed the final bedding on which were subsequently placed the precast columns.

A Railway Bridge Span Pushed Off Its Pier by a Barge

A tow-barge pushed a 150-ft. span of the Wheeling & Lake Erie Ry. bridge over the Maumee River, off its pier at Toledo, Ohio, on June 14, 1914. The photographs herewith picture the effects of the collision. The barge pushed one end of the span off its bearings and across the length of the pier, so that both trusses cleared the pier and the span dropped into the river at that end. Span and pier were damaged slightly. The barge had a section of its bow crushed in. The city's fire-alarm and police wires crossing the bridge were broken by the accident.



WHEELING & LAKE ERIE RY. BRIDGE AT TOLEDO; SPAN PUSHED OFF PIER BY COLLIDING BARGE

The wrecked span is just west of the drawspan of the bridge. A steamer towing a steel barge was entering the river, light from Cleveland to take on coal. They passed through a railway bridge below this one without trouble, but at the Wheeling & Lake Erie bridge, while the steamer was just passing through the west opening of the draw, a gust from the east slewed the barge over to the west. Although the steamer promptly cast off the

tow-line, the barge struck the end of the span just west of the draw, wrecking the span as noted.

The same bridge has been struck by vessels on two previous occasions, equally serious damage resulting. It is believed locally that the service of tugboats for tows of this kind should be made obligatory.

The Great Lakes Dredge & Dock Co. is replacing the span.

City-Planning Competition Awards, Richmond, Calif.

A city-planning competition in which a number of engineers were among the 146 contestants and in which two of the five second-prize men were engineers, has recently been reported on. The competition was for the subdivision, largely for industrial purposes, of 350 acres of land at the end of the new river harbor of Richmond, Calif. The prizes ($5000 for the first and $1000 each for the five next in merit) were offered by H. C. Cutting, Monadnock Building, San Francisco, Calif., the owner of the land to be subdivided.

The first prize was awarded to Arthur C. Comey, Landscape Architect, Cambridge, Mass. We reproduce Mr. Comey's design and also one of the most interesting of the second-prize designs, which was by Taggart Aston, Civil Engineer, San Francisco. The other four second prizes were:

Philip W. Foster, Landscape Architect, Cambridge, Mass.
Berthold Wuth, Assistant County Surveyor, Oakland, Calif.
L. A. de Milt, Jr., Landscape Architect, Indianapolis, Ind.
W. S. Farley, Civic Engineer, Stege, Calif.

Because of the number of engineers included we also give the list of those who received honorable mention:

J. H. Weatherford, Civil Engineer, Memphis, Tenn.
Woollett & Woollett, Architects and Engineers, San Francisco, Calif.
A. H. Payne, Civic Engineer, Memphis, Tenn.
H. J. Bernier, Oakland, Calif.
J. F. Beaman, San Rafael, Calif.
Walker & Vawter, Architects, Los Angeles, Calif.
F. C. Innes, Civil Engineer, Sheridan, Calif.
R. H. Dobell, Architect, Portland, Ore.

The jury, which sat three days on the designs, was as follows.

Charles D. Heywood, Mayor of Berkeley, chosen by the contestants.
C. F. Michaels, President San Francisco Chamber of Commerce, representing the owner.
C. E. Grunsky, former City Engineer of San Francisco, of the San Francisco Association of Members of the American Society of Civil Engineers.
Louis C. Mullgardt, President San Francisco Society of Architects.
C. H. Cheney, City Planner and Advisor to the Competition.

We are informed by Mr. Cheney that:

It was necessary for the contestants to consider and solve the problem of docks, shipping facilities, a business district and railroad and water approaches.

The winning design presents a fairly feasible plan for a center of this type, with ample diagonal streets and careful location of districts—industrial, shipping and business, for the best cutting of the property. The designs submitted were distinctly above the average, and the owner of the property was much pleased with the results obtained.

In view of the likelihood that there will be many such competitions in the future and because it contains ideas on city planning which may be of assistance to our readers, we reprint the substances of "The Verdict of the Jury," as follows:

The tract to be subdivided is especially adapted for use in bringing ships and rail together. The proposed Government harbor can be conveniently and naturally extended into the tract and the harbor extension thus provided will be exceptionally well sheltered by the ridge of hills at the west. The transfer of freight from rail to boat and the transfer of freight from river steamers to ocean-going vessels over conveniently located docks or through water-front warehouses has in this design been given due consideration. We feel that the plan could be improved by the adoption of simpler harbor lines. There should be no solid fill projecting out into the harbor in order that the length of water front to be bulkheaded may be kept at a minimum.

The harbor outline is such that all parts thereof can be made accessible by rail, and berth space for vessels can be provided adequate to meet the requirements of both the large ocean-going and the smaller bay and river craft.

The areas back from the water front will naturally be used for large and small manufacturing establishments whose proximity to a water front is an advantage. This use has been foreseen in this plan as in most of the designs submitted and suitable provision has been made, not alone for factory sites, and access to them by rail, but also for adequate streets. Where the plan shows a subdivision into units that are small, these can readily be modified to suit requirements.

The development of a business district along the northern edge of the tract, along and near Cutting Boulevard, is recognized in this as in many of the other designs and is a strong point in its favor.

An extension of the open waterway of the harbor to the extreme northern limits of the tract is objectionable for various reasons, notably because an excessive harbor length may result in the accumulation of foul waters in the upper end of the harbor, and because such extension would confine the traffic that will ultimately obtain between the heart of Richmond and the main harbor to too narrow a strip of ground at the easterly base of the hills. These facts have been recognized in the design.

The crossing of Cutting Boulevard by rail, except possibly at its extreme westerly end, should be avoided. Access to the water front of this property by rail should, therefore, be preferably from the southwest, by belt line railroad, and perhaps later from the east, across a water-front section of Richmond, which will, however, probably be the last of the water-front areas to be fully developed. For some time in the future no other access to the property by rail may be feasible, except from the northwest. Any arrangement providing for such a location of the tracks of the Southern Pacific or the Santa Fé should, if possible, be made with the understanding that in the course of time, when other facilities are provided, the use of any such tracks can be discontinued.

The location of the 350 acres under consideration is such that practically no portion thereof will ultimately be residence property. The reservation of areas thereon for parks and playgrounds is, therefore, regarded as of minor importance. There should be reservations upon the hills at the west and in the business and residence areas to the northward of Cutting Ave.; but some open spots, spots that can be adorned with trees and that can be made available for recreation, are nevertheless desirable and their inclusion in this and other projects is commended.

The alignment of principal streets in a direction from northwest to southeast with adequate streets passing the upper end of the harbor toward the northeast is in conformity with the ultimate demands of traffic as now foreseen.

As the entire tract of land is low and will require filling it is desirable that the harbor area be kept fairly large, as it is to be assumed that most of the material for the fill will be excavated from the harbor. At the same time, the water surface must not be too large, because there would then be a needless sacrifice of area which would otherwise be available for commercial, industrial, and business purposes.

The other five designs which have been selected as being next in the order of merit have been passed on with reference to the degree in which they fulfill the general requirements of the problem as we see it, and with due regard also to the incorporation of novel ideas which have distinct merit.

There were 146 separate designs to be passed upon, eight of which had to be disqualified because they were received after the final hour set in Paragraph 16 of the program. Many of those not included among the first six have decided merit and you may yet find that someone not among those selected by us conforms better to your personal idea of the way in which the tract should be developed.

CHAS. D. HEYWOOD,
C. E. GRUNSKY,
C. F. MICHAELS,
L. C. MULLGARDT,
C. H. CHENEY,
Jury Selected for the Competition.

From the concluding paragraph, we infer that the conditions of the competition were such that the owner of the land and donor of the prizes may choose for execution any of the designs entered in the competition.

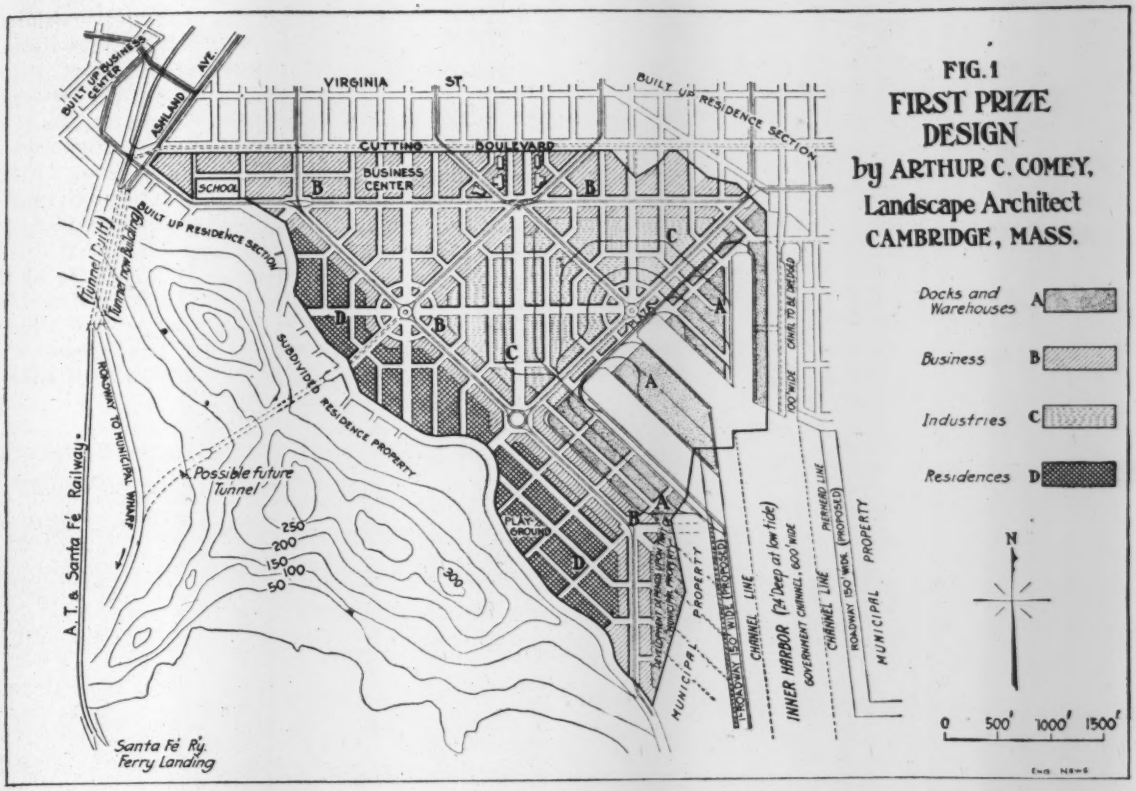


FIG. 1
FIRST PRIZE DESIGN
by ARTHUR C. COMEY,
Landscape Architect
CAMBRIDGE, MASS.

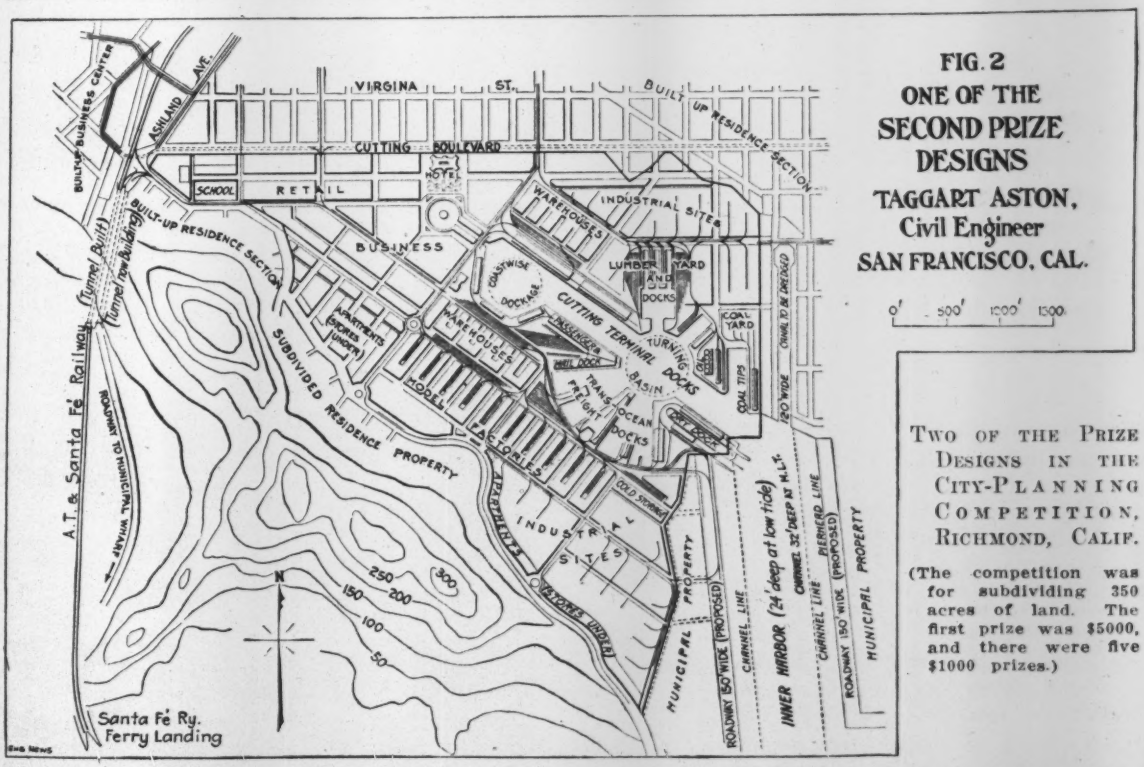


FIG. 2
ONE OF THE SECOND PRIZE DESIGNS
TAGGART ASTON,
Civil Engineer
SAN FRANCISCO, CAL.

TWO OF THE PRIZE DESIGNS IN THE CITY-PLANNING COMPETITION, RICHMOND, CALIF.

(The competition was for subdividing 350 acres of land. The first prize was $5000, and there were five $1000 prizes.)

Such a choice would seem to be doing over again the work done by the judges, and might seem discourteous to them as it certainly would be discouraging to all the contestants, except the one favored by final choice. We shall be surprised if the owner of the land does not confine his selection to one of the six designs, although, pushed to a full logical conclusion, the sort of reasoning that would confine the choice to the prize designs would lead to carrying out the first-prize design. The final decision of the owner will be awaited with interest.

A Flood in Boulder Creek, Colorado, with Damage to Water-Works

By H. E. Phelps*

Due to a flood in Boulder Creek, Colorado, on June 1 and 2, 1914, considerable damage was done to the water-works of Boulder, and to bridges, roads and farms along

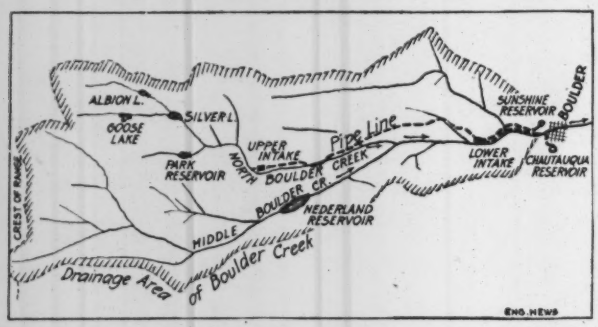


Fig. 1. Drainage Area of Boulder Creek, Colorado

the Creek. It was only by a narrow margin that a water famine in the city was averted.

Boulder Creek, which flows through the city, has a drainage area of 179 sq.mi., roughly trapezoidal in shape (Fig. 1), with the longer base of the trapezoid on the continental divide, 25 mi. west of the city. Its elevation varies from 5400 ft. at Boulder to 13,600 ft. at points along the continental divide, and it is entirely mountainous. The precipitation varies from an average of 17.7 in. at Boulder to over 40 in. along the divide. Boulder Creek is formed by the junction, about 12 mi. above the city, of Middle Boulder and North Boulder Creeks. Middle Boulder is the larger and on it, about 18 mi. west of Boulder, is the Nederland Reservoir of the Colora[illegible] Power Co. This is formed by a straight, gravity s[illegible] tion, concrete dam, 177 ft. high, 624 ft. long on t[illegible] and has a capacity of 524,000 cu.ft. The city derives [illegible] water-supply from North Boulder Creek, at the hea[illegible] waters of which it has three storage reservoirs, known a[illegible] Albion, Silver and Goose lakes.

Albion Lake is at an elevation of 11,000 ft., and is formed by a curved, gravity-section concrete dam, finished to a height of 38 ft. out of a projected 60 ft.

Goose Lake is at an elevation of 11,000 ft., and is formed by a timber crib dam, 30 ft. high. Silver Lake, at an elevation of 10,200 ft., is formed by an old timber crib dam, 14 ft. high. The combined capacity of these lakes is now 110,766,000 cu.ft. These are all enlargements of natural lakes.

The water is diverted from North Boulder Creek at the upper intake by means of a wooden headgate and short canal, into a lake of a capacity of 1,240,000 cu.ft., formed by an earth dam, 15 ft. high. This lake is at an elevation of 8200 ft. and is above all mills and other sources of pollution.

From the upper intake, the water is conducted to the old or lower intake, at an elevation of 5850 ft., through 16,500 ft. of 18-in. Converse joint steel pipe, 16,800 ft. of 15-in. pipe, and 3800 ft. of 12-in. pipe. The 18-in. pipe is laid through the cañon of North Boulder Creek, which is extremely rough and rocky, making it necessary to lay the pipe close to the channel of the creek in many places, and to cross the creek in two places. This pipe line discharges into the basin at the lower intake, where water was taken directly from the creek previous to 1907. From this point, two independent pipe lines lead to the city, one discharging into the low level or Sunshine distributing reservoir, at an elevation of 5598 ft. and with a capacity of 770,000 cu.ft., and the other into the high level or Chautauqua distributing reservoir, at an elevation of 5792 ft., and with a capacity of 495,000 cu.ft. The lower reservoir serves the business section and the lower land

*City Engineer, Boulder, Colo.; Assistant Professor of Civil Engineering, University of Colorado.

Fig. 2. Snow in the Drainage Area of Boulder Creek, March, 1914

on each side of the creek, giving pressures from 60 to 130 lb., and the higher reservoir serves the higher residential district, giving pressures up to 170 lb. These are operated as two independent systems.

This last winter was an extremely severe one on the watershed of Boulder Creek. The accompanying table shows the precipitation at Silver Lake and at Boulder.

PRECIPITATION AT BOULDER AND SILVER LAKE, INCHES

Month	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Total
Boulder	2.24	0.00	4.20	0.00	....	1.77	3.38	....	.....
Silver Lake....	2.17	1.66	6.84	4.34	2.75	3.87	3.99	2.92	28.54
Snow at Silver Lake	35	21	87.	68	43	57	57	25	393

It will be noticed that the total snowfall was 393 in., a large part of which was on the ground as late as May 1, 1914, in immense drifts. Fig. 2 shows conditions in March. The runoff at Silver Lake had been maintained at 5 sec.-ft. by drawing on the storage lakes until May 15, when due to the warmer weather the lakes commenced to fill and the flow from Silver Lake increased to 70 sec.-ft. on May 29.

On the afternoon of Monday, June 1, a heavy rain fell in the higher mountains. At Silver Lake, this rain amounted to 1.16 in., and this rain had been preceded on May 25 by a similar rain of 1.01 in. The weather between these dates was warm, with unusually warm nights for that altitude, causing the snow to melt rapidly. These conditions caused Boulder Creek to rise rapidly until on the morning of June 1 it was carrying 1300 cu.ft. per sec. This flow was more than 300 sec.-ft. above all previous records, with the exception of the big flood of 1894, which has been estimated to have been 13,000 sec.-ft.

This flow in the creek caused considerable alarm among the people living in the low lands along the creek, which was considerably increased by wild reports of the breaking of the Nederland Reservoir and of the Silver Lake Dam, early in the evening of June 1. The flow did in fact begin to increase rapidly late in the afternoon of June 1, and early in the evening a flow of 950 sec.-ft. was reported at the Nederland, and very high water at the upper intake. This flow at the Nederland Dam evidently alarmed the caretaker there, for one of the outlet valves was opened some time during the evening, and 600 sec.-ft. added to the flow over the spillway. At about 11 p.m., a sudden great increase in the flow of North Boulder Creek was noted at the upper intake. This was due to the breaking of the Park Reservoir Dam on Caribou Creek, a small tributary of the North Boulder. This dam was a combined earth and rock-fill structure, completed to a height of about 15 ft. out of a projected 70 ft. It held at the time of the break about 6,000,000 cu.ft. of water. The flow of the stream was taken care of by two outlet pipes through the dam, presumably open at the time, and by a timber flume or spillway, set in the top of the earth section of the dam. The failure started at this flume, and a gap about 60 ft. wide was made entirely through the dam, as shown by Fig. 3.

FIG. 3. BREAK IN EARTH PORTION OF PARK RESERVOIR DAM, BOULDER WATER-WORKS

FIG. 4. RESULTS OF FLOOD ON TRESTLE OF DENVER, BOULDER & WESTERN R.R.

The crest of the flood reached Boulder about 2 a.m., June 2, and amounted to about 4000 sec.-ft.

The flood in North Boulder Creek, reinforced by the breaking of the Park Reservoir, destroyed the wagon bridge and the trestle of the Denver, Boulder & Western R.R., at Bluebird (Fig. 4), filled the upper intake to within 8 in. of the top of the dam, and then washed out the spillway, lowering it 3 ft., choked the channel under the wagon bridge at Lakewood with drift and washed out one approach, broke the upper pipe line in three places, and filled about a mile of it with an unknown amount of sand and rock. This line was also washed bare of its riprap protection walls in a number of places, and is still menaced by the cutting of new channels formed during the flood.

Below the lower intake, the flood exposed the pipes in several places, destroyed one riprap retaining-wall; and then broke the line serving the high-level reservoir. The flood also washed out two of the three mains served from the low-level reservoir and crossing the creek within the city limits, thus leaving a part of the city dependent on one long 4-in. main for fire-protection.

Tuesday morning, June 4, found repairs in progress. The distributing reservoirs held about three days' supply

after the leaks through the various breaks had been found and shut off. The break in the lower cañon was repaired in about 30 hr., it being necessary to cut a length of 15-in. steel pipe to take the place of a length that had disappeared. A ditch was dug from the creek to the lower intake and water was diverted directly from the creek at this point, but not until the supply in the distributing reservoir had been almost exhausted. The water at this point was very dirty for several days, and is still (June 13) not clear. To give fire-protection to the above mentioned area an 8-in. line supported on one of the bridges was connected up with one of the washed-out lines.

At this writing, the work of repairing the mountain pipe line is in progress, and it is expected that within three weeks of the date of the flood this line will be in commission, and the city will be again receiving pure water from the mountains.

The flood also destroyed a good many wooden wagon bridges, badly washed the wagon road in places and the approaches of several bridges, and destroyed several crude diverting dams for irrigation ditches.

Flood Control and Land Drainage Conference

A conference for the purpose of assisting the promotion of legislation to provide protection against floods and the reclamation of land by drainage was held at the La Salle Hotel, Chicago, on June 17, under the direction of the National Drainage Congress, with Edmund T. Perkins, of Chicago, in the chair. There was an attendance of 25 or 30, including engineers, legislators, business men and others interested, and great diversity of opinion was expressed as to the way in which water control and regulation should be effected. In the call for the meeting it was stated that the most serious obstacle to favorable legislation is that the advocates of conservation, reclamation and kindred subjects are not in agreement as to the legislation desired. It is desirable to bring into harmony and coöperation the various interests and organizations concerned with flood protection, drainage, irrigation, water power and public health.

Three general methods of administration were suggested: (1) by a national Department of Public Works, whose secretary would be a member of the cabinet; (2) by a national Water Council; and (3) by an organization similar to the U. S. Reclamation Service, which has handled the government irrigation work. The first plan was considered good in theory, but too comprehensive to be advocated in the present case, since such a department would have such a wide range of subjects under its control. C. G. Elliott (Washington, D. C.) thought it inadvisable to cover too much in any one bill, but on the other hand, there is danger of conflicting plans in too many individual bills. E. T. Perkins thought that a policy of stream regulation would cover all the related matters noted above (floods, drainage, power and health). Prof. W. K. Hatt (Purdue University) spoke of the work of the Indiana Flood Commission, and Col. C. McD. Townsend (U. S. Corps of Engineers) spoke in relation to the Mississippi River work.

The plan advocated by Mr. Perkins was the establishment of a National Water Council of 12 members, constituted as follows: the president, the four secretaries of Agriculture, Commerce, War and Interior (all of which departments have relations to the general subject), two senators, two congressmen, two advisory members and the chairman of a special Water Control Board. Each of the four government departments mentioned would have a technical official whose duty it would be to report to this Board on all matters handled by his department (and its various bureaus) which are related in any way to the general subject.

This plan was endorsed by a committee appointed at the meeting, and a resolution was adopted to the following effect:

> The questions of flood control, drainage, irrigation, water power, navigation and related subjects have become of such importance that early national legislative action should be taken to enable the secretaries of the government departments, who now have jurisdiction of these subjects, to bring the same into coördination, and sufficient funds should be appropriated to enable these problems to be properly investigated by the said secretaries.

A Large Drifting-Sand Water-Filtration Plant for Toronto, Ont.

To supplement its recently built slow sand filtration plant the city of Toronto has awarded a contract for a novel type of mechanical filtration plant, with a daily capacity of 60,000,000 Imp. gal. or 72,000,000 U. S. gal. The filter, which is known as the Ransome drifting-sand filter, has as its typical feature a continuous washing system. This is provided by drain pipes so arranged that water and sand are always being drawn from the bottom of the filter, to be continuously replaced. Drawing out the sand in this manner makes the remaining bed of sand take the shape of a series of peaks, rounded off rather flatly at the top. A coagulant is used but no coagulating basin is provided. There are no rate controllers. The stationary body of sand, which is having the surfaces of its peaks continually scoured off and renewed, has to be washed, the promoters of the filters state, only once a week. The sand bed is much deeper than in the ordinary filter of either the mechanical or slow sand type. The required wash water is estimated at 2% of the raw water pumped and 1% of the water filtered, these percentages being for the continuous washing and the periodic reverse-flow washing, respectively.

As will appear later in this article, this type of filter has been little used as yet and that little only on a small scale. This perhaps explains the long time that elapsed between the opening of bids and the award of the contract, which extended from Feb. 3 to June 8, 1914. It should at once be noted, however, that an experimental plant was built in Toronto and operated for 33 days in the first half of 1913, under the direction of Dr. Chas. J. Hastings, Medical Officer of Health, and Dr. G. G. Nasmith, Director of Laboratories.

Comparison of Bids

According to a report to the Board of Control of Toronto, dated Apr. 15, 1914, submitted by R. C. Harris, Commissioner of Public Works, lump-sum bids were secured from four concerns, as follows: (1) the John ver Mehr Engineering Co., Ltd., Confederation Life Building, Toronto, and Wm. Cowlin & Son, $1,096,277 for

concrete filter tanks and buildings, or $1,177,054 for brick and concrete buildings and steel filter tanks; (2) Laurin & Leitch, of Montreal, "contractors on a large scale," with whom were associated the New York Continental Jewell Filtration Co., of New York, $1,197,580; (3) an unnamed informal bidder, $1,500,000; and (4) another unnamed bidder, $1,733,464, whose bid, Mr. Harris states, was not considered because it was too high.

In his report of Apr. 15, Mr. Harris stated that he also dismissed from consideration the lower of the two ver Mehr bids "owing to the superiority of the steel filters [to concrete] and the comparatively small difference in price" between the bids—approximately $80,000—and because of other preferences which he stated. This left the choice between the ver Mehr bid of $1,177,054 and the Laurin & Leitch (New York Continental Jewell Filtration Co.) bid of $1,197,580. The apparent difference of nearly $20,000 in favor of the ver Mehr bid was increased to $166,102 by (1) requesting the ver Mehr Co. to make certain deductions to put the bids on a comparable basis and (2) by making additions to the competing bid for the same stated reason. One of the deductions from the ver Mehr bid, amounting to $92,031, was to correct a "misunderstanding" which led to bidding on a 72,000,000-Imp.-gal. plant instead of a 60,000,000-gal. and the other deduction was for changes in material for some of the buildings, $18,741. After these deductions the bid of the ver Mehr Co. stood at $1,166,102. In the further process of equalization for comparative purposes $34,804 was added to the bid of the New York Jewell Continental Filtration Co., making a total of $1,232,384. Of the addition, $25,000 was for 250 ft. of 72-in. pipe which the city would have to lay in excess of that required under the ver Mehr bid and $9904 for Venturi meters on each filter outlet, which Mr. Harris states were omitted by the New York Co. as unnecessary.

Mr. Harris' recommendation that the contract be awarded on the revised basis of $1,066,282 was adopted by the Board of Control on the same day (Apr. 15) and after the matter had been referred back to the Board several times the city council made the award on June 8, as already stated.

Outline of New Plant

The location for the new filters is about 170 ft. west of the westerly wall of the existing slow sand filters, on Toronto Island. The plant will include coal storage, chemical storage and a chemical building, all under one roof, besides a suction well, boiler house, pumping station, three 36-in. electric-driven centrifugal pumps, with steam turbo-generators in reserve, filter house, wash-water tank, and Venturi meters on the outlet pipe from each filter. There will be ten filter units, consisting of steel tanks 50 ft. in diameter, with an open space 16⅔ ft. in diameter in the center of each for the supply pipes, sand washer and sand conveyor.

How the Drifting-Sand Filter Works

The operation of the Ransome drifting-sand filter is described by the bidder as follows:

The filters to be installed will be that type known as the Ransome Drifting Sand Filter, the distinctive feature of which is the employment of a gradually moving body of sand as the primary or roughing filtration medium, which eliminates as a continuous process the main impurities from the water prior to its passage through the final filtration medium or stationary sand. Governed by its natural angle of settlement, the moving sand almost imperceptibly gravitates, grain by grain, toward a system of collecting or extracting points at the bottom of the filter arranged in a system so as to divide the filter into 30 equal sections. The sand with added water then passes to a central collecting point and is elevated to a sand washer placed centrally at the top of the filter, where, after being thoroughly and automatically cleansed of its impurities, it will be continuously caught up by the incoming water and deposited again on the moving sand surface at the top of the filter. The stationary sand forms naturally into pyramidal shapes with rounded tops, offering a large surface to the passage of the filtering water. This surface is more than twice the plan area of the filter. The stationary sand rests upon gravel from which it is separated by perforated brass screens and the water is collected from a number of brass and cast-iron collecting pipes from the bottom of each of the 30 sections.

The elimination of the main impurities by the moving sand will enable this filter to carry on a continuous filtration process without washing back, for a period of about one week, thus assuring continuous and practically uniform results.

The loss of head in the filter gradually increases from a minimum of 5 ft. at the commencement of a run to a maximum of 12 ft., when it becomes necessary to wash back the filter with a high rate wash of 15 gal. per sq.ft. per min., using filtered water, for which an overhead tank with duplicate pumps to fill it with, will be provided. The slow rate at which the filters clog, removes the desirability of providing rate controllers, as all that is necessary is that the attendant should adjust the main outlet valve once or twice a day to the desired requirement.

The operation of the sand extractors is such that they are controlled by the raw wash water, which, if shut off, causes the extractors to cease operating and when the water is applied again to start working as before.

With this type of filter the need for coagulating and sedimentation basins is avoided; indeed, as proved by the slowness of the clogging of the stationary sand, and the efficiency of filtration, the drifting sand is much more effective in removing the impurities than sedimentation basins. Thus it is not proposed to provide mixing, coagulating or sedimentation basins, but to apply the coagulant to the main raw water pipe opposite the chemical house. The mixing of this coagulant with the water will be perfect, in that it will first of all have to pass through the suction well, where it will receive considerable natural mixing, and afterward through the pumps where the mixing with the raw water will be complete. Further intimate mixture between the sulphate of alumina and the raw water takes place at the sand washer and the distribution pipes so that by the time the water reaches the filter a thorough mixture is absolutely assured.

Mr. Harris states in his report that the sand in each filter will be 9 ft. deep and that the filtered water will be treated with hypochlorite. The contract time for completion, provided that the bid had been accepted by Apr. 27, was one-half of the plant in operation by Aug. 15, 1915, and the remainder by Nov. 1, 1915. The New York Co. offered to complete the plant within 20 months if the contract was signed by May 1, 1915.

Preliminary Tests

As has been stated, a 33-day test of an experimental filter was made in 1913. This filter (which was 13½ ft. in diameter) was located at West Toronto and treated water from Humber Bay. Dr. G. G. Nasmith, Director of Laboratories, Toronto, in reporting (July 13, 1913) on his test of this filter stated that the bacterial reduction (on standard agar) was from 1458 to 15 per c.c., or 99%; that 98% of B. coli and "99% of red colonies growing on neutral red bill salt agar (Dr. Houston's formula) were removed." The alum used ranged from 0.85 to 1.5 grain per Imp. gal. [0.7 to 1.25 grain per U. S. gal.] He added:

The effluent was invariably bright and sparkling without any trace of turbidity. From these results it is perfectly

obvious that this type of filter is capable of rendering any water as safe as any other type of mechanical filter known.*

NOTES ON THE HISTORY OF THE DRIFTING-SAND FILTER

This type of filter originated with and has been worked out by William Gore, M. Inst. C. E., formerly of England, now in Toronto, at one time associated with the late Geo. F. Deacon. The first and until recently the only plant in regular operation was one of a few hundred thousand gallons capacity at Merthyr Tydfil, Wales. A 13,500,000-Imp. gal. plant is now being built in installments for Merthyr Tydfil, to be completed in three years. The first of these installments is now nearly finished. A contract has been secured for a plant for Kingston, West Indies, consisting of ten 10½-ft. units, with a total capacity of 3,000,000 Imp. gal.

The only drifting-sand filter plant yet in regular service in North America was built for the Marine Fisheries Department of the Dominion Government. It is located at Collingwood, Ont., was put in operation in October, 1913, and consists of two 8-ft. units with a combined daily capacity of 400,000 Imp. gal.

The drifting-sand filter is being promoted in England by the Ransome-ver Mehr Machinery Co., which also handles concrete machinery. In Canada, the filter is being promoted by the John ver Mehr Engineering Co., Confederation Life Building, Toronto. John ver Mehr is Managing Director, Wm. Gore is Consulting Engineer and Wm. Storrie is Chief Engineer of the company.

St. Paul Meeting of the American Society of Mechanical Engineers

The Spring convention of the American Society of Mechanical Engineers was held last week at St. Paul and Minneapolis, and about 125 members and over 200 guests were registered in attendance.

A party of about 80, from Chicago and the East, traveled to St. Paul on a special train from Chicago via the Burlington route, stopping on the way at De Soto, on the Mississippi River, to examine work in progress on widening embankment and double-tracking. Material is being taken from the river here and placed in the bank by a centrifugal-pump dredge capable of delivering 11,000 cu.yd. of sand per day of 22 hr. through a 4000-ft. pipe line delivering the material at 25-ft. elevation above the river. The centrifugal pump is driven by a 1000-hp. triple expansion condensing engine, furnished with steam by a battery of three water-tube boilers.

Another interesting exhibit shown to the party was an enormous C. B. & Q. freight locomotive, which is said to be the largest locomotive in service, not including the articulated or Mallet compound locomotives. This huge machine weighs 576,580 lb., of which 310,800 lb. is on the ten driving wheels. Its traction power at $\frac{1}{4.22}$ coefficient of friction is 71,500 lb. The locomotive is equipped with the Street automatic stoker, burns slack coal costing 85c. per ton and has a record of hauling a train of 85 cars weighing 5812 gross tons over a divisi 136 miles long with a grade of 0.3%.

At Lake Pepin, 75 miles south of St. Paul, a thr hour stop was made and the party was entertained wi motor boat and automobile rides.

The opening session of the convention on Tuesd evening was given up to addresses of welcome by Ho A. O. Eberhardt, Governor of Minnesota, representative of the Mayor of St. Paul, and the Chamber of Commerc and by Messrs. Max Toltz and Paul Doty, representing the local engineers' reception committee.

At the business meeting on Wednesday morning, th most important matter dealt with was the preliminary report of the Committee on standard specifications for steam boilers and a standard code for examination of firemen and boiler inspectors. This committee, of which John A. Stevens, of Boston, is the chairman, has sent out widely for discussion and criticism a proposed set of specifications and codes. It is stated that several State legislatures are likely to enact laws on this matter at their next session and are looking to action by the Society for their guidance. It was finally decided that the committee should hold a session for the further consideration of its proposed standards on Sept. 15 next and all interests affected by the proposed legislation are to be invited to present their views in writing at least a month before the date of the meeting.

Three papers on burning powdered coal occupied the remainder of the morning session. Prof. R. C. Carpenter, of Cornell, gave a historical account of the adaptation of powdered coal to the portland-cement industry and summarized current practice at the present day. Messrs. Wm. Dalton and W. S. Quigley described the powdered-fuel system applied to metal-heating furnaces at the American Iron & Steel Works at Lebanon and Reading, Penn., and at the Schenectady works of the American Locomotive Co. This application of powdered coal is comparatively recent and promises to generally replace both fuel oil and producer gas for metallurgical furnaces of certain classes. Tests were reported showing that the powdered-coal furnace costs only half as much for fuel as the oil-fired furnace and that the saving in labor compared with furnaces using lump coal for fuel was even greater.

The third paper, by Fred R. Low, gave an account of the work of various inventors who have tried to develop the powdered-coal furnace for use with steam boilers. It appears that automatic stokers and other devices now burn coal under boilers so efficiently and economically that the cost of pulverizing alone is sufficient to make burning powdered coal for steam making an uncommercial proposition.

Several who contributed to the written discussion of these papers described their own experience in burning powdered coal and generally agreed with the statements in the several papers.

The Wednesday afternoon session opened with a paper by Prof. J. W. Roe, of Yale University, on Industrial Service Work in engineering schools. The paper referred to the work now being done by some 2000 engineering students in various engineering schools in teaching and rendering special service to workmen, especially those of foreign birth. This movement, which is under direction of the Young Men's Christian Association, was described in ENGINEERING NEWS some months ago. In the dis-

*No other test data are given in the report. There were no parallel tests of other types of mechanical filters. The experimental plant has been continued in operation more or less continuously ever since the date of the tests, but we are unable to state the results or whether analyses have been made meanwhile.—Ed.

cussion, the work was highly commended by Vice-President Henry L. Gantt, who acted as presiding officer in the absence of the President, James Hartness.

A paper on the classification and heating value of American coals by Wm. Kent gave figures for commercial coals computed from tests by the U. S. Bureau of Mines. W. W. Boyd, of Baltimore, presented a paper describing the detail design of a railroad track scale to meet present-day requirements. A machine for testing the strength of gear teeth was described by Wilfred Lewis, of Philadelphia. A new apparatus for measuring the flow of fluids in closed pipes, claimed to have advantages over both the Pitot tube and the Venturi meter was described by A. M. Levin, of Chicago. The principle of the new apparatus is the measurement of the pressure produced by the fluid due to its centrifugal force in passing around a curve or elbow, in which pressure ports are provided.

On Wednesday evening, John Hearding, of Duluth, Superintendent of the Oliver Iron Mining Co., and one of the pioneers in the Minnesota iron industry, gave a lecture illustrated with moving pictures on the methods of mining and transporting iron ore which have been developed in the last quarter century. It is of interest to note that the traffic of the Duluth-Superior harbor during 1913 was 31 million tons, a tonnage greater than that of any seaport in the world. The bulk of this traffic is iron ore from the Mesabi range.

On Thursday morning special trolley cars conveyed the visitors to Minneapolis, where a session was held in one of the new engineering buildings of the University of Minnesota. The visitors were welcomed in addresses by Dr. H. T. Eddy and other representatives of the University.

A. F. Meyer, of St. Paul, described the new hydro-electric plant now under construction on the Mississippi between St. Paul and Minneapolis as part of the government project for navigation improvement. The dam will produce a head of about 34 ft. but this is much reduced when the river is in flood and the amount of power is also reduced to a comparatively small amount when the river is low. During 1910, there were 75 days when the available power, had the plant been in operation, would have fallen below 5000 kw. For successful commercial operation, therefore, an auxiliary steam plant is necessary and the paper was chiefly devoted to showing the computation by which the economic capacity of an auxiliary steam plant was determined. The power is to be chiefly used for municipal purposes in the Twin Cities ;and Mr. Meyer's estimates showed a probable saving to the public from the operation of the plant amounting to $200,000 per annum.

This paper was followed by one on "Methods of Coal Handling at the Head of the Lakes," by G. H. Hutchinson, Chief Engineer of the Northwestern Fuel Co., in which the evolution of coal-handling plants during the past quarter century was described.

The concluding paper of the meeting was by Chas. A. Lang and described the methods of flour milling now in use in Minneapolis, the greatest flour-milling center in the world. The Minneapolis mills have a combined capacity of 84,000 barrels of flour per 24 hr. There are 23 separate mills, making the average capacity of each 3600 bbl.; but the largest of all, the Pillsbury A mill, has made 16,125 bbl. of flour in 24 hr. The 23 mills are owned by three great companies.

Modern flour milling is a complicated process compared with the simple grinding of wheat with buhr stones in universal use a generation or so ago. Besides all the processes of preliminary cleaning, which the wheat undergoes, there are no less than 21 separate grindings which the wheat receives from the original wheat kernel to the finished flour. For sifting the flour, no satisfactory substitute for the fine hard-woven silk bolting cloth has ever been found.

After adjournment, the party assembled for luncheon in the fine new mechanical-engineering laboratory of the University, which is the most spacious and has the best provision of light and air of any mechanical-engineering laboratory in this country that we recall. Luncheon was served here and then a special train over the Great Northern Ry. conveyed the party to the famous Lake Minnetonka. Most of the visitors were surprised to find that Lake Minnetonka is not a single lake but a labyrinth of lakes, islands, peninsulas and connecting channels covering an area some 16 miles long and 10 miles in breadth, and distant a dozen miles from Minneapolis. A pleasure resort of such natural beauty and variety is possessed by hardly another city in the world. Landing on the shore of Harrison Bay, the visitors were conveyed in motor boats to the beautiful summer home of Mr. Gebhard Bohn, where varied entertainment was provided for them during the afternoon and evening.

Many of the visitors remained on Friday to visit the many interesting engineering plants in the Twin Cities and others joined an excursion to Duluth where they were entertained by a special committee of Duluth engineers.

NEWS NOTES

An English Train Went Through a Bridge at Battingorm, Inverness, on the Highland Ry., on June 18, killing about seven persons.

The 130-Ft. Wood Bridge of the Texas-Mexican Ry. Was Burned on June 7. The bridge spanned Pescatico Creek, 15 miles from Laredo.

A Traction Engine Broke through a Highway Bridge in Louisville, Ohio, on June 9. The engine was kept from falling into the creek by the girders.

A Coal-Mine Explosion at the Hill Crest mine in Alberta, Can., on June 19, from ignited gas, resulted in the death of 199 men. All but eight bodies have been recovered.

A Subway Blast Broke a 36-In. Water Main in New York City on June 15. Blasting was going on in an excavation for the new subway at Van Cortlandt and Jerome Aves.

A 14-Ft. Sewer Trench Caved In in Los Angeles, Calif., on June 11, killing one workman and injuring two others. The accident was due to the shoring being displaced by an earth slide.

Fire Damaged the Missouri River Draw Bridge at Jefferson City on June 15. The fire originated in the engine room near the center of the bridge after the draw span had been opened to let a boat through. The wood floor of the bridge was considerably damaged in the vicinity of the draw span.

A Water Tank Collapsed at Fulda, Minn., during a high wind of recent date. According to local press reports it was full of water at the time. The structure fell upon the village opera house, demolishing it. "The Manual of American Water-Works" states that the water-works of Fulda was built in 1895 by the town, and included an 18x24-ft. wood tank supported on a wood trestle 80 ft. high.

A Derrick Fell in the erection of the new Morrison Hotel in Chicago, June 13. It was a large steel derrick and a broken cable allowed the beam to fall across the alley at the rear of the building. Fortunately it was on a level with the roof of a heavily built modern building on the other side of the alley, so that no great damage was done. The cable and block dropped into the alley, but nobody was injured.

Three Steamships Ran Ashore on the British coast recently. On June 17, the British hospital ship "Maine" went ashore in the Firth of Lorne, on the west coast of Scotland. She was badly damaged and her crew in small boats was picked up by other boats. On June 18, in a heavy fog, the "Buelow," of the China service of the North German Lloyd, a vessel of 500 tons, went ashore on the rocks in Blacknor Bay, to the west of Portland Hill. On June 23, the Red Star liner "Gothland," 7600 tons, bound from Montreal to Rotterdam, struck on Gunner Rocks, near Lands End. At last accounts her crew and passengers were safe.

A Steamship Collision in a Channel Fog occurred when the "Kaiser Wilhelm II," of the North German Lloyd Line and the 3000-ton grain steamer "Incemore," came together in the English Channel on June 17. The "Kaiser Wilhelm II" was nearing the Needles when she was struck amidships on the starboard side by the "Incemore," which was badly damaged about the bow and compelled to put into port immediately. The German liner returned to anchorage about three miles off Southampton, England. The passengers of the "Kaiser Wilhelm II" were transferred to the "Imperator," which left Southampton June 18.

A Biplane Rammed An Army Dirigible, near Vienna, on June 20, during Austrian army manœuvres. Both craft were destroyed and their occupants, nine military and naval officers and noncommissioned officers, were killed. The Austrian army dirigible balloon, "Koerting," ascended at a point about 12 miles from Vienna, to take photographs of the movements of the troops below. A half-hour later a biplane started from the same spot, overtaking the slower craft. In endeavoring to take a position directly above the balloon, the biplane rammed the dirigible, causing the gas bag to explode. This is claimed to be the first accident of this character on record.

Another Dock Fire—An extremely destructive fire occurred on June 19 in the Kingston Dock at Glasgow, Scotland. The wharf on which the fire started is a timber structure founded on timber piles and carrying a timber structure founded on timber piles and carrying a timber shed. The fire soon got beyond the control of the fire department which had the entire city service at the shore end and two fire boats on the water side working throughout the day. The destruction of the shed was expedited by taking fire of a number of barrels of seal oil which had just been discharged from a steamer on the quay at the east end of the dock. When the masonry quay wall here gave way a number of the barrels of the oil fell into the water and the rest caught fire and emitted so much smoke as to prevent the further fighting of the fire for some time. The destruction includes the entire wharf structure with freight handling machinery and four ships which were tied up to the adjoining quay and which could not be pulled out in time. The official estimated loss is about a million dollars $1,000,000.

Lowell Trainshed Roof and Bridge Collapse—An accident of very unusual character occurred at Lowell, Mass., on the morning of June 17. Part of a street bridge on which Chelmsford St. crosses the Boston & Maine Ry. south of Chelmsford Street Depot, and parts of the trainshed under the bridge collapsed in the course of repair work. At this point the railway is in deep excavation, the cut being about 75 ft. wide by 40 ft. deep, walled with stone retaining-walls. Part of the cut is roofed with a trainshed roof carried on steel trusses resting in the side walls. The Chelmsford St. bridge, crossing on a skew of about 45°, has its floor supported by columns resting on the shed trusses below. A small store adjoining the bridge to the north also rested on these roof trusses. The trainshed roof is over 30 years old, and the wrought-iron truss members were deteriorated by corrosion. Repairs of the roof had recently been undertaken. In the course of these repairs, on June 17, two trusses at the north end of the bridge fell to the tracks below, carrying with them the store and a small portion of the bridge roadway. The gang of men at work on the truss repairs, and several people in the store, fell with the wreckage, but no one was killed. Just before the collapse a passenger train which had been standing practically under the part of the roof which fell, pulled out of the depot. The causes of the collapse will be determined by full investigation.

The Suit of the Ramapo Water Co. to sustain its alleged right to supply New York City with water and to prevent the new Catskill water-supply developed by the city from going into operation has been dismissed in the Federal court on account of lack of jurisdiction.

A Four-Mile Brick Road As a Memorial—According to a dispatch in the St. Louis, Mo., "Times," of June 3, John W. Kitchell and his wife, of Pana, Ill., have donated a vitrified brick pavement, four miles long, to be built south and east from the village of Rosemond, Ill., as a memorial of Mrs. Kitchell's father. The road is to cost $55,620.

The Collection of Panama Canal Tolls begun on May brought in $7356, which amount was paid to the United Sta on June 18.

Oil-Pipe Lines Were Held To Be Common Carriers, a therefore, subject to regulation by the Interstate Comme Commission, by the Supreme Court, Washington, D. C., June 22.

The Plan To Sell Two United States Battleships to Foreign Power for the price paid for them by the Unit States, was abandoned by Congress and the Navy Depa ment on June 16. The matter came up in the shape of Senate amendment to the naval appropriation bill, and w objected to by the small-navy section of the House.

A Natural Asphalt Deposit Has Been Discovered on t Island of Leyte, one of the Philippine group, according t press dispatches of June 21. About 4000 tons are in sigh and much more in prospect. The report states that the m terial is of good quality and suitable for any purpose. Th Leyte deposit was discovered by a government forester.

San Francisco May Acquire All Street Railways—The United Railroads of San Francisco are willing to negotiat with the city for the sale of their lines, according to Jess Lilienthal, president. Bion J. Arnold, street railway expert, is in favor of the city's purchasing the company's system and operating it in connection with the recently construct municipal lines.

Contract to Salvage the Wrecked "Empress of Ireland," sunk in the lower St. Lawrence River, May 29, by the collier **"Storstad," was awarded to the Canadian** Salvage Association. A hospital lock, 16x5 ft., will be employed in the diving work which will have to be carried on in quite deep water (80 to 100 ft.). Mr. Webster, Vice-President of the association, states that the work will take about two months.

The Hamburg-American Liner "Bismarck," which will share with the "Vaterland" the honor of being the largest ship in the world, was launched at Hamburg on June 20. The "Bismarck' is 955 ft. long, of 100-ft. beam and is expected to have a tonnage of about 58,000 tons. Together with the "Imperator" and "Vaterland," she will be used for express transatlantic service from New York to Hamburg.

The Consolidation of the Building, Fire and Tenement House Departments of New York City has been suggested as a means of reducing the duplication-of-inspection nuisance complained of in New York City (see editorial comment, p. 1372 of our issue, of June 18, 1914.) This suggestion was made before the New York State Factory Investigating Committee, by Abram I. Elkres, Secretary (170 Broadway, New York City), at a hearing on June 18.

"Gaillard Cut" (Culebra Cut)—President Wilson, on June 22, endorsed the plan of the South Carolina Federation of Women's Clubs to change the name of the famous Culebra Cut, at the Panama Canal, to Gaillard Cut, as a tribute to the memory of Lieut.-Col. David Du Bose Gaillard, formerly engineer in charge of that section of the Canal construction. Col. Gaillard died from the effects of his 12 years at Panama, on Dec. 5, 1913 ("Eng. News," Dec. 11, 1913, p. 1206).

A Municipal Market System for Chicago has been recommended by the Chicago Municipal Markets Commission in a preliminary report to Mayor Harrison. Wholesale terminal markets, retail markets in some possible cases and farmers' markets are advised. A trolley freight service for country produce is also recommended. The report contains many data on food markets and marketing in relation to living costs. The committee was appointed by Mayor Harrison and had as its secretary Frederick Rex, Municipal Reference Librarian, City Hall, Philadelphia.

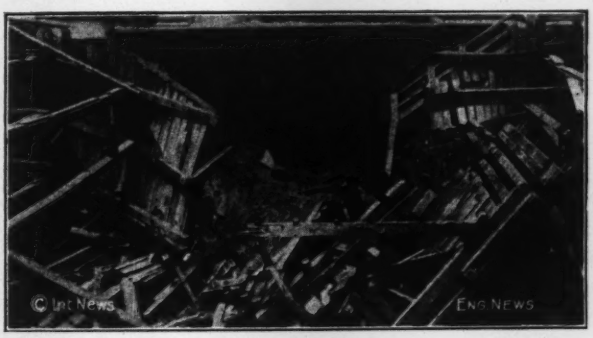
The Injunction Suit Against the Discharge of Sewage from the Passaic Valley trunk sewer into New York Bay, brought against the Passaic Valley Sewerage Commission by citizens of Paterson, N. J., was dismissed by the New Jersey Court of Errors and Appeals on June 15. The decision confirms the opinion of the lower court. An injunction suit to the same end was begun some years ago in the name of New York State but merely by the City of New York and much testimony had been taken, but there appears to be likelihood of an early decision. Meanwhile construction work on the trunk sewer is progressing.

The Constitutionality of the Tice Highway Law of Illinois has been upheld by the State Supreme Court in the case of a citizen of Sangamon County, who contended that the law was local and special in its application. The Tice law provides that in order to receive allotments from the state, the county

must raise within six months an equal amount by a special tax or by a bond issue, if available funds are not in the county treasury. The roads and bridges are constructed half at the expense of the county, but are perpetually maintained by the state. Actual work on state-aid roads under this law has been held up for many months awaiting the issue of this test case. The State Highway Commission has the power to determine the character of the road surfacing, and this has led to controversies with local authorities. In some instances the local County Supervisors have asked for macadam roads and the Highway Commission has insisted on concrete or brick or none.

Water Shortage at Bloomington, Ind., has given rise to much public agitation of late, both locally and among the alumni of Indiana University, which is located at Bloomington. A conference on the subject was held at Indianapolis on June 15, at which there were present alumni and officials of the university, citizens and the mayor of Bloomington, and Governor Ralston. A motion was adopted requesting the governor to appoint a committee to keep track of the situation and to report to the governor at intervals, with the idea that if the city does not take proper steps to secure an adequate and safe water-supply the legislature will be asked to take drastic action—possibly looking to the removal of the university to some other site. It is stated that water shortages occurred in 1899, 1901, 1904, 1908 and 1913, as well as this year; and that three different outside engineers have advised the city to make radical improvements in the supply. Too many local "experts" is given as the reason why this advice is not heeded. Reports of typhoid fever caused by the water appear to have been exaggerated statements of the facts. The Bloomington supply is from several impounding reservoirs said to be fed by springs. The choice for a new supply is reported to lie between Griffey Creek and the White River. J. G. Harris, mayor of Bloomington, has promised that the city will take prompt action to meet the situation.

A Cave-In in the Open Cut being made for the Fourth Ave. Subway in Brooklyn, N. Y., caused the collapse of the crossbracing and sheeting, the fall of a derrick mounted on the cross-bracing, the death of one workman and the serious injury of seven others on June 22. The subway at this point, between 76th to 77th Sts., is being dug in a wide, open cut,



COLLAPSED SHEETING AND BRACING IN SUBWAY OPEN CUT

braced with heavy timbers. The cause and the precise nature of the collapse are not known at present. The Degnon Contracting Co., New York City, is the general contractor on this section, and Carpenter, Boxley & Herrick, Inc., of Roanoke, Va., are subcontractors. The foreman for the subcontractors was arrested.

The Miami Conservancy or Flood Prevention District for the benefit and protection of Dayton and the Miami Valley, petition for which was filed on Feb. 18 under the Ohio Conservancy Act of 1914, is still in abeyance. The Conservancy Court, composed of one Common Pleas Judge from each of the ten counties wholly or partly in the proposed district, voted 5 to 4 in favor of the constitutionality of the act and jurisdiction of the court, one Judge being absent because ill. To obviate trouble over the question whether this was a majority vote, the Conservancy Court dismissed the question, thus making an appeal possible. After previous rulings on technical points the Court of Appeals ruled, on June 3, that the law was unconstitutional as regards a point stated below; that the constitutionality of two other features was in doubt, and that questions as to the justness of the law in other particulars would be subject to later construction. Other constitutional points raised by objectors to the granting of the petition were overruled and the judgment of the Conservancy Court was reversed and the case remanded for further proceedings under the Conservancy Act. The opponents of the proposed district have by law seventy days in which to decide whether to carry the case to the State Supreme Court for final decision, but have verbally agreed to give their decision at an earlier date. The feature of the law ruled unconstitutional, but which the court held did not invalidate the rest of the act, was one which authorized any conservancy district to levy a 0.3-mill tax to defray preliminary expenses. We are informed by S. H. Ankeney, of the Dayton Flood Prevention Committee, that the ruling on this particular point, even if sustained by the State Supreme Court, would not prevent action by the proposed Miami Conservancy District, since Dayton "is paying all organization expenses from its $2,000,000 fund secured by popular subscription last year."

PERSONALS

Mr. K. K. Kuney, formerly Assistant Engineer of the Great Northern Ry., has been appointed Locating Engineer under the Alaska Engineering Commission.

Mr. Charles Neilson, former General Manager of the Cincinnati, Hamilton & Dayton Ry., has opened offices at 30 Broad St., New York City, as a Consulting Engineer.

Mr. Harry F. Sawtelle, Assoc. M. Am. Soc. C. E., of Cambridge, Mass., has been appointed Engineer of the Watuppa Ponds and Quequechan River Commission of Fall River, Mass.

Brig.-Gen. William C. Gorgas, Surgeon General, U. S. A., former Chief Sanitary Officer of the Panama Canal Zone, was awarded the degree of Doctor of Laws at Yale University, June 17.

Mr. J. R. Shidler, Highway Engineer, U. S. Office of Public Roads, has resigned to become County Highway Engineer of Coahoma County, Miss., which is contemplating the expenditure of $500,000 on road improvements.

Mr. Keppelle Hall, for several years Works Engineer of the National Cash Register Co., Dayton, Ohio, and recently in contracting work in the Middle West, has become associated with Sanford E. Thompson, M. Am. Soc. C. E., Consulting Engineer, Boston, Mass.

Mr. H. B. Shoemaker, recently Roadmaster of the Lake Shore & Michigan Southern Ry., at Dunkirk, N. Y., has been appointed Engineer of Maintenance-of-way of the Chicago, Indiana & Southern R.R., succeeding Mr. M. C. Cleveland, resigned, as noted in our issue of May 21.

Mr. J. C. West, recently Local Manager of the Sullivan Machinery Co., at San Francisco, Calif., has been promoted to be General Sales Engineer, with headquarters at Chicago, Ill. He is succeeded at San Francisco by Mr. Ray P. McGrath, recently connected with the Boston, Mass., office.

Mr. Weston E. Fuller, M. Am. Soc. C. E., of the firm of Hazen & Whipple, Consulting Engineers, New York City, has been awarded the graduate Fuertes Medal of the College of Civil Engineering, Cornell University, for his paper on "Flood Flows," presented to the American Society of Civil Engineers last February.

Mr. Jean M. Allen, M. Am. Soc. M. E., formerly Superintendent for the Burns Bros. Dredging & Engineering Co., Chicago, Ill., has opened offices in the First National Bank Bldg., Chicago, as a Consulting Engineer, specializing in hydraulic dredging and hydraulic fill projects and in the design of hydraulic and dipper dredges.

Mr. J. A. Craven, Assoc. M. Am. Soc. C. E., has resigned as Sanitary Engineer and Water Chemist of the Indiana State Board of Health, Indianapolis, Ind., to accept a position with Mr. Morris Knowles, M. Am. Soc. C. E., Consulting Engineer, Pittsburgh, Penn. Mr. Craven is succeeded at Indianapolis by Mr. John C. Diggs, former Assistant Water Chemist.

Dr. Antonio Llano, Civil Engineer, author of engineering textbooks and editor, has established a bureau of Spanish-English and English-Spanish translations, of which he is Manager and Editor, with offices at 19 North Mountain Ave., Montclair, N. J. He will specialize in technical and scientific textbooks, articles, works of reference and reports, legal and diplomatic documents and advertisements, which are to be either translated or prepared.

Mr. A. F. Dorley, Superintendent of Water Service of the Missouri Pacific Ry., has been promoted to be Principal Assistant Engineer, with headquarters at St. Louis, Mo. Mr. Dorley was born at Lancaster, Penn., in 1875 and graduated in civil engineering at Notre Dame University, South Bend, Ind.,

in 1900. Most of his early engineering experience was with the Baltimore & Ohio Southwestern Ry. In April, 1906, he joined the staff of the Missouri Pacific Ry. as Assistant Engineer at St. Louis. He was appointed Superintendent of Water Service in 1910.

Dr. Roland P. Davis, Jun. Am. Soc. C. E., Professor of structural engineering at West Virginia University, has been appointed Bridge Engineer of the West Virginia State Road Bureau, of which Mr. A. D. Williams is Chief Engineer. Dr. Davis is a graduate of the Masachusetts Institute of Technology and of Cornell University. After two years' experience with the American Bridge Co., he was appointed Instructor in structural engineering at Cornell University. Since 1911 he has been the head of the department of structural and hydraulic engineering at West Virginia University.

Mr. William A. Bole, M. Am. Soc. M. E., Assistant General Manager of the Westinghouse Machine Co., Pittsburgh, Penn., has been elected Vice-President in charge of production and erection for the plants at East Pittsburgh and at Trafford, Penn. Mr. Bole has been in continuous employ of the company since August, 1882, having successively filled the positions of General Shop Foreman, Superintendent, Manager of Works and Consulting Engineer, and has therefore taken part in the growth and development of the company since it employed less than 100 men until the present, when the total forces run up into the thousands.

Mr. A. N. Johnson, M. Am. Soc. C. E., has resigned as State Highway Engineer of Illinois to accept a position with the Bureau of Municipal Research, New York City, effective July 1. Mr. Johnson is a native of Massachusetts and graduated in civil engineering at the Lawrence Scientific School, Harvard University, in 1894. He was an instructor at Harvard in 1895 and 1896, and then for two years was Assistant Engineer of the Massachusetts Highway Commission. From 1898 to 1905, Mr. Johnson was State Highway Engineer of Maryland. For a year he was Chief Engineer of the U. S. Office of Public Roads, Washington, D. C., and since 1906 has been State Highway Engineer of Illinois.

OBITUARY

Paul Haupt, a prominent contractor of Los Angeles, Calif., died June 12. He was born in Germany 61 years ago and went to Los Angeles in 1894.

Samuel Adrian Everette, a consulting engineer of Hermando, Miss., committed suicide on a train of the Central of Georgia R.R., near Griffin, Ga., June 15.

Arthur L. Northrup, First Assistant Engineer, New York State Highway Department, died June 17, at his home in Owego, N. Y. He graduated in civil engineering at the Rensselaer Polytechnic Institute in 1900 and became connected with the New York Highway Department in 1906.

Alfred J. Hadder, a pioneer settler of Indiana and at one time engaged as a civil engineer in the survey and construction of some of the early railways in the Middle West, died June 15, aged 86 years, at the home of his son in Newton, Mass. After giving up engineering work he studied law, and for many years was a practicing attorney at Cincinnati, Ohio.

James Moore Swank, for many years General Manager of the American Iron and Steel Association, author of "History of the Manufacture of Iron in All Ages," and of numerous reports on the iron and steel industry, died at his home in Philadelphia, aged 82 years. He was born in Westmoreland County, Penn., July 12, 1832. His parents removed to Johnstown in 1838, where he was educated. From 1852 to 1870 he was Editor and Publisher of newspapers in Johnstown and vicinity. After two years as Clerk of the Committee on Manufactures of the United States House of Representatives and as Chief Clerk of the Department of Agriculture, he went to Philadelphia to take charge of the work of the American Iron and Steel Association, as Secretary and General Manager. He held this office for 40 years, until Jan. 1, 1913.

ENGINEERING SOCIETIES

COMING MEETINGS

AMERICAN SOCIETY FOR TESTING MATERIALS.
June 30-July 3. Seventeenth annual meeting at Atlantic City, N. J. Secy., Edgar Marburg, University of Pennsylvania, Philadelphia, Penn.

AMERICAN SOCIETY OF ENGINEERS, ARCHITECTS AND CONSTRUCTORS.
July 3-4. Convention at Brighton Beach, L. I. Secy., T. Hugh Boorman, 35 W. 39th St., New York City.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.
July 9-11. Semi-annual meeting at Cleveland, Ohio. Secy., J. J. Blackmore, 29 W. 39th St., New York City.

OHIO ELECTRIC LIGHT ASSOCIATION.
July 16-19. Annual convention at Cedar Point, Ohio. Secy., D. L. Gasgill, Greenville, Ohio.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.
Aug. 20-21. Annual meeting in New York City. Secy., E. H. Harman, Room 101, Union Station, St. Louis, Mo.

AMERICAN PEAT SOCIETY.
Aug. 20-22. Annual meeting at Duluth, Minn. Secy., Julius Bordollo, 17 Battery Place, New York City.

Master Car Builders' and Master Mechanics' Associations—The regular annual meetings of the two railway mechanical associations were held this year at Atlantic City for the ninth successive time, in connection with the usual extensive exhibition of railway machinery and appliances. The attendance of members was greater than ever before, but the exhibitors fell off slightly from recent years, due no doubt to the business depression.

The most important subject brought up before the Master Car Builders' Association was the report of the Committee on Couplers, which has narrowed the investigation into a standard coupler down to two types, on which extensive tests are being made. The president elected for the ensuing year is D. F. Crawford, General Superintendent of Motive Power, Pennsylvania Lines West.

In the American Railway Master Mechanics' Association, the three subjects of most importance were superheaters, mechanical stokers and headlights. The reports and discussions on the former two indicated that both had passed beyond experimental stage and will from now on be very necessary parts of railway mechanical equipment to be studied for improvements and not for justification. The locomotive headlight question is discussed on the editorial pages of this issue. For the ensuing year, F. F. Gaines, Superintendent of Motive Power, Central Georgia Ry., was elected President.

American Institute of Chemical Engineers—The sixth semi-annual meeting was held in Troy, N. Y., June 17-20, with about 30 members in attendance. There were various technical excursions and much routine business was transacted, including the presentation of reports. Important among these items was the description of the "standard combined catalog" of all manufacturers to be issued under the auspices of the Institute by F. W. Dodge Co. (and any other concerns who might try such an enterprise, though this one has succeeded to all previous projects in varied lines).

The President's address, by Prof. M. C. Whitaker, of New York, was an argument for greater exchange of information among chemical industries instead of the "trade-secret" policy which prevails.

A paper, "Studies on Filtration," by J. W. Bain and A. E. Wigle, described their search for data on the residual absorption of filtering layers of inert matter. They quoted Slichter's studies (of underground flow) and stated they had checked them as applied to industrial filtering. They reported about 30% voids in filter media, irrespective of size of grain. Under gravity the bed held 11 to 20% moisture; under vacuum filtering this was some 7 to 10% and in a centrifugal dryer, 2½%.

"The Application of Physical Chemistry to Industrial Processes," by W. F. Rittman, showed how equilibrium between constituents and end products was changed by temperature and pressure and how this was made to increase desired yields.

The paper "Ozone in Ventilation," by J. C. Olsen and W. H. Olrich, was an attack on the recent work of Drs. Jordan and Carlson (in which was found no bactericidal effect in air, no real deodorizing and only unfavorable physiologic action). Numerous original studies were presented which showed that there was a true oxidation of volatile odorous substance. The ozone was found some hundred times more perceptible by smell than even ammonia or hydrogen sulphide; small amounts of ozone masked the other odor until the oxidation was under way when the older odor prevailed. Complete oxidization of an odor therefore required relatively large amounts of ozone—comparing them by perceptibility.

Contents of the papers, "Scrubber for Vacuum Laboratory Apparatus," by Chas. Baskerville, "Combination Water Softener and Storage Tank," by L. M. Booth, "Development of Rotary Furnaces," by R. K. Meade, and "Present Patent Situation," by M. Toch, are indicated by the titles.

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Issued Every Thursday
Hill Publishing Company

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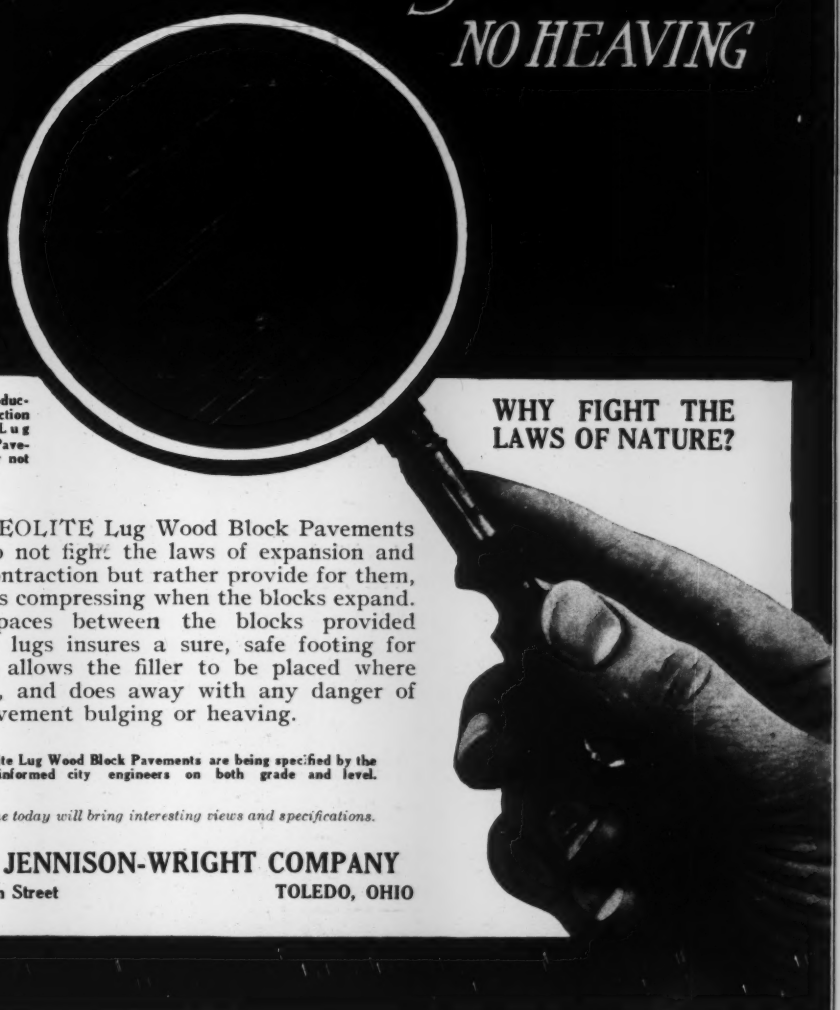

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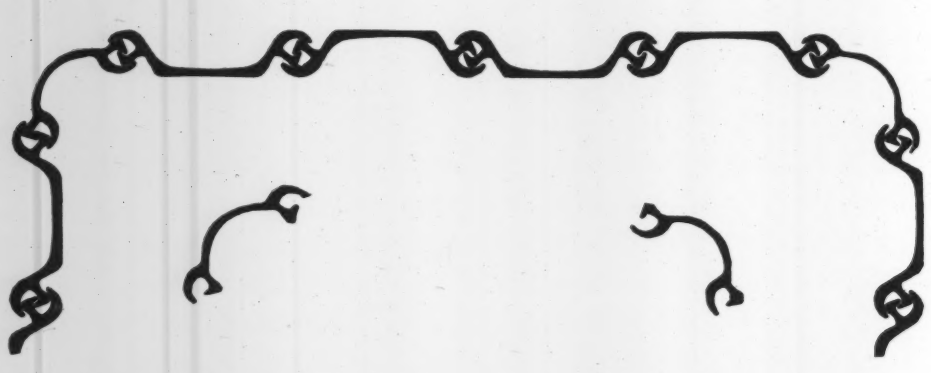

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Engineering News

CHARLES WHITING BAKER, *Editor*

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $7.00 in Canada.

Published Weekly By HILL PUBLISHING COMPANY
505 Pearl Street, New York, N. Y.

JOHN A. HILL, Pres. ROB'T MCKEAN, Sec'y.

Cable Address: "ENGNEWS"

To foreign countries, including postage, $9.00 or its equivalent, 38 shillings: 38 marks: or 47 francs. Subscriptions for Great Britain, Europe or British Colonies may be sent to London Office, 6 Bouverie St., London, E. C., England. Notice to change address should be written to the New York Office in every instance. Advertising copy should reach New York Office two weeks before date of issue. Entered at New York Postoffice as mail matter of the second class.

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*AUDUBON SEWAGE-TREATMENT PLANT: *Page* 1402

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*MANUFACTURE OF CONCRETE BLOCK FOR RIVER PROTECTION MATTRESSES: *Page* 1044

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*PILE AND CONCRETE SEA-WALL FOR LAND RECLAMATION AT NEW ORLEANS: *Page* 1411

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Brief extract from address of Prof. Harold B. Smith, of the Worcester Polytechnic Institute. 500 w. ENGINEERING NEWS, June 25, 1914.

*SPECIAL CONCRETE PILING FOR A VIADUCT FOUNDATION: *Page* 1412

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*TRACTOR TRUCKS FOR USE WITH ELECTRIC LOCOMOTIVES: *Page* 1414

Describes extra tractor truck for locomotives, Butte, Anaconda & Pacific Ry. 600 w. 1 ill. ENGINEERING NEWS, June 25, 1914.

*UNION STATION AT DALLAS: *Page* 1415

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*SPHEROIDAL-TANK GAS HOLDERS, A MODERN GERMAN TYPE: *Page* 1418

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*CITY-PLANNING COMPETITION AWARDS, RICHMOND, CALIF.: *Page* 1442

The sum of $10,000 was offered by a private owner for designs for subdividing for industrial purposes 350 acres of land adjacent to the new inner harbor of Richmond, Calif.; many engineers competed and one was awarded a second prize, while others received honorable mention. 1200 w. 2 ill. ENGINEERING NEWS, Jun 25, 1914.

*FLOOD IN BOULDER CREEK, COLORADO: *Page* 1444

A flood which occurred on June 1 and 2 washed out a portion of a water-works dam and supply main, destroyed a wagon bridge and damaged a trestle. 4 ill. ENGINEERING NEWS, June 25, 1914.

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10. To determine what is the highest and largest function of the field which he serves, and then to strive in every way to promote that function.

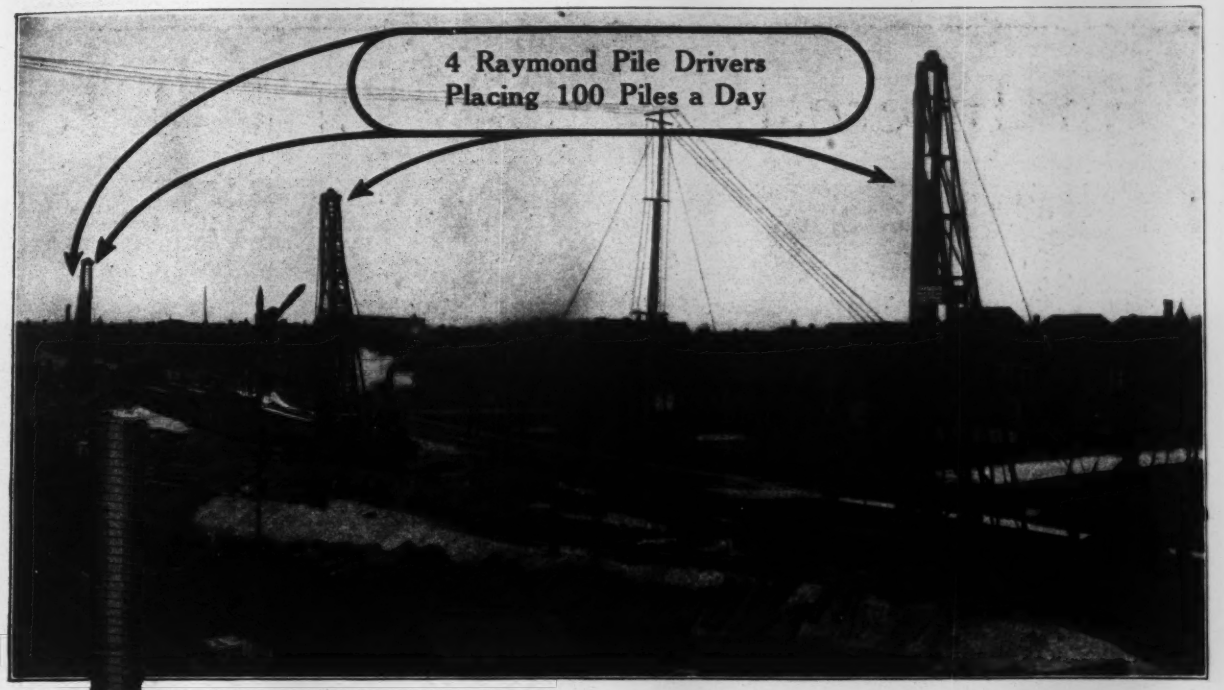
These accepted "Ten Commandments" help to show why it is that the buyer can now place so much dependability on the reading and advertising pages of his technical or trade paper.

It is interesting here to note, too, the the remarkable similarity of these "Standards of Practice" to the Hill Advertising Code—a code made and adopted by the publishers of ENGINEERING NEWS for the mutual protection of the buyer and the seller, who use its advertising pages, long before the "Standards of Practice" were evolved.

The publishers of ENGINEERING NEWS have always been pointed out as the conspicuous example of "truth in publishing."

They were the *first* to publish the circulation of every issue—the *first* to classify subscribers by occupations—the *first*, among technical publishers, to establish service work for its advertisers—and the *first* technical publishing house to publish a code of advertising ethics.

All of which means a better paper for the advertiser, a safer and surer guide for the buyer.



12,000 Raymond Concrete Piles in This Railroad Job

You have probably noticed that we show a great deal of railroad work. This is, of course, because we *get* a great deal of railroad work.

Railroad work must be done rapidly and, when finished, be a first-class job throughout.

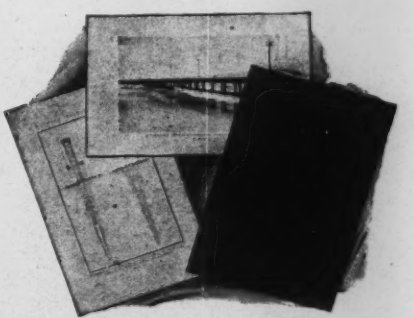
The above is the track elevation work in Chicago for the Chicago, Rock Island & Pacific, Mr. C. A. Morse, Chief Engineer.

The work as a whole will require 12,000 Raymond Concrete Piles.

With four pile-drivers at work it is going ahead very rapidly—100 piles per day—and without interference to traffic.

The Chicago, Rock Island and Pacific might have used wood piles, **but they didn't.** They might have used other concrete piles, **but they didn't.**

Their attitude was similar to that of other large concrete pile users. With wood piles and other concrete piles they might have gotten a satisfactory job; with Raymond they were absolutely sure to.



Don't forget the 168-page Raymond Book and our latest booklet "The Making of a Raymond Concrete Pile."

Raymond Concrete Pile Company

New York
140 Cedar Street

Branch Offices in all Principal Cities

Raymond Concrete Pile Co. of Canada, Ltd., Montreal, Can.

Chicago
111 W. Monroe Street

An Interesting Story of Failure —and Success

$25 Worth of Trus-Con Waterproofing Paste, *Concentrated*, Succeeds, where Thousands of Dollars spent on other methods, Failed.

THE LEHIGH COAL AND NAVIGATION COMPANY
BANGOR, ME.

October 23, 1913.

Messrs. N. H. Bragg & Sons,
Bangor, Me.

Gentlemen:—

I have refrained from reporting the results of our waterproofing until the Trus-Con work had adequate water-resisting tests.

The last three weeks of rain have afforded us satisfactory demonstration of the goodness of Trus-Con Waterproofing Paste *Concentrated*.

Our pocket is erected over a tunnel, about 150x8x8, and beneath the tunnel is a subterranean river, ice-cold, and with swift current. At farther end of tunnel a ledge retarded the egress of water down the sloping tract on which the pocket is built. Though the tunnel was well built, the action of the river and boiling springs nearly broke its back, despite the several thousands tons of deadweight. The floor and both sides of tunnel opened, and the water at times poured through the fissures. An endless carrier with several hundred balancing buckets runs in the tunnel, through ends and across top of pocket.

Frequently, upon starting work for the day, and particularly in winter, we would find a seepage during the night of about 30,000 to 35,000 gallons of crystal, cold water in the tunnel, submerging the buckets. In zero weather, the attendant ice, to put it mildly, was costly and annoying.

The combined efforts of rotary pump and six-inch drain leading from far end of tunnel failed at all times to carry off the water.

We had the tunnel waterproofed two years ago, and for a time it held. Although at no time did this repaired tunnel have so long a siege of rain feeding the river and springs, it eventually broke under strain less severe than to which subjected since October 1.

Finally, we evolved a new plan.

We dug auxiliary side drains, giving total drainage length of about 3,000 feet, blasted the ledge, and then, having as we believe, diverted the water in a measure, we followed your Trus-Con Book to the letter, and used that wonderful compound in repairing and waterproofing the great fissures in our heavy concrete tunnel floor and walls.

The work was performed under great difficulties, as water constantly was bubbling up in the tunnel, although diminished in a measure by the new drains. The concrete mixture with Trus-Con in it hardened in the water, and it was remarkable to note its stiffening propensities under circumstances that would simply wash away ordinary concrete as fast as placed in position.

This river and the springs, we believe, from analysis and topographical research, come from Moosehead Lake, which has an elevtion of about 1,100 feet or higher than seven Niagaras, above our tunnel.

Trus-Con Waterproofing Paste, *Concentrated*, we believe has solved our costly, vexatious and at times baffling problem. I might add that the *cost of the waterproofing did not exceed* $25.00 *although several thousands had been expended previously* in the attempt to overcome the trouble. We will gladly impart personal information, and exhibit the work to any others annoyed by similar troubles, and show them how to overcome them with Trus-Con, properly applied.

Very truly yours,
(Signed) J. McLEOD, Agent.

Write us in detail on any waterproofing or dampproofing problem that you have. You will receive a detailed reply. Our consulting service is yours without charge.

The Trus-Con Laboratories

Inventors and Manufacturers of

Waterproofings, Dampproofings, Technical Paints

1212 Trus-Con Building - Detroit, Michigan

In over 20 large buildings* in 17 different cities, the

Ford Motor Co.

have adopted United Steel Sash for windows. The Ford Motor Co. is well known for efficiency of organization and scientific methods of buying. Thus

UNITED STEEL SASH

again satisfy the most rigid requirements of quality, service and economy. United Steel Sash are adapted to all classes of buildings and include all types of pivoted and sliding sash, continuous sash, casements, partitions, doors, etc.

Write for Sash hand book and our suggestions for your building—FREE.

TRUSSED CONCRETE STEEL CO.

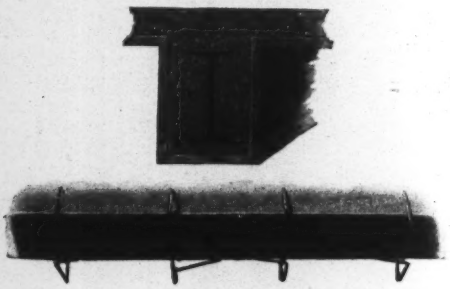
Dept. S-12 **YOUNGSTOWN, OHIO**

Reinforcement, Metal Lath, Steel Sash, Armor Plates, Waterproofing, Specialties.

KAHN Building Products

* John Graham is the architect for nearly all the buildings shown in these illustrations.

A Page of ECONOMICS



X-Tension Clip for Fireproofing I-Beams and Columns.

Havemeyer Bars and Ty-Chairs

and the other Specialties shown on this page will

Save You Money

They are labor-savers.
They are time-savers.
They are trouble-savers.
Increasing demands prove it.

Descriptive Booklets now ready. Get them.

Concrete Steel Company

New York
32 Broadway

Chicago
Monadnock Bldg.

Philadelphia
Pennsylvania Bldg.

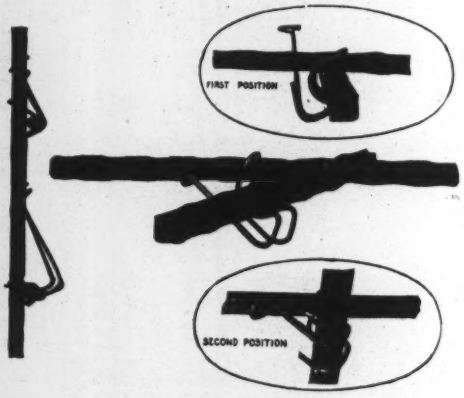
Boston
7 Water St.

Youngstown, O.
P. O. Box 24

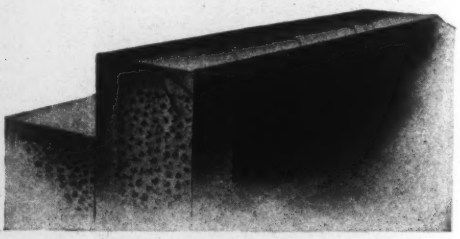
WAREHOUSES

CHICAGO
PHILADELPHIA
YOUNGSTOWN
NEW YORK

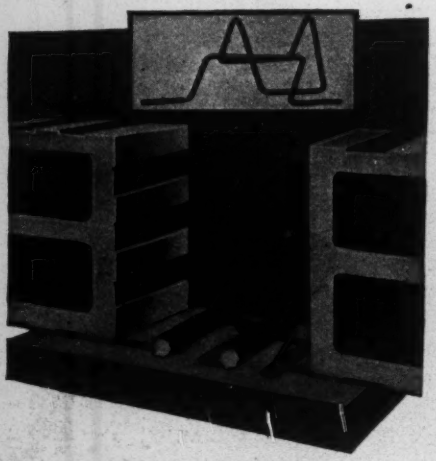
Stocks in all the principal cities



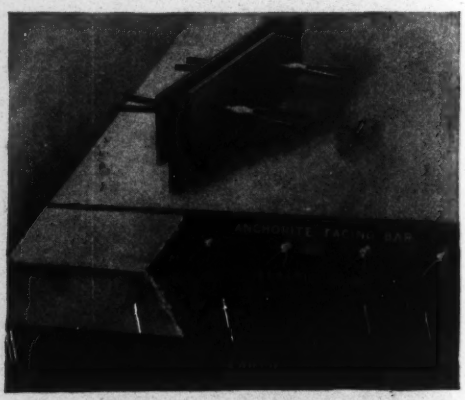
Ty Chairs.
For tying and supporting any type of Reinforcing Bars.



Anchorite Facing Bar for Curb Corners.

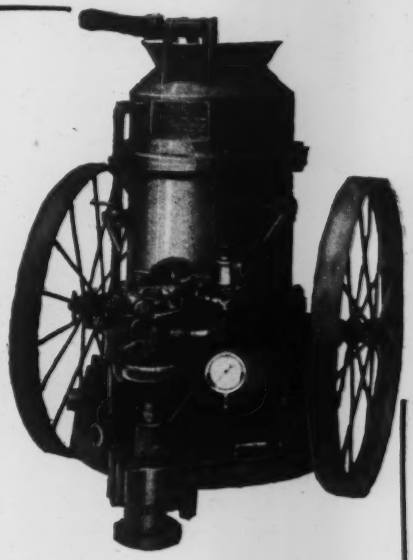


Easel Chairs.
For Tile and Concrete Joist Construction.



Anchorite Facing Bar for Expansion Joints.

The CEMENT-GUN



A Portable, Convenient Machine for Use in and Around Industrial Plants—Wherever There Is Concreting to Do.

The low type of Cement-Gun is especially adaptable to use in confined places. It is only 4′ 8″ in height and 3′ 1″ in width. It is easily moved from place to place. Operated by compressed air.

The product of the machine, "Gunite," is deposited on the surface to be cemented with great force, making the coating more dense and solid than ordinary concrete or mortar. And, can be applied without forms.

There are a hundred uses for the Cement-Gun in and around your plant. For instance, making your buildings fireproof and permanent, rustproofing your steel structures, waterproofing, repairing defective concrete, etc.

The Cement-Gun will do your work quicker and more economically than any other method.

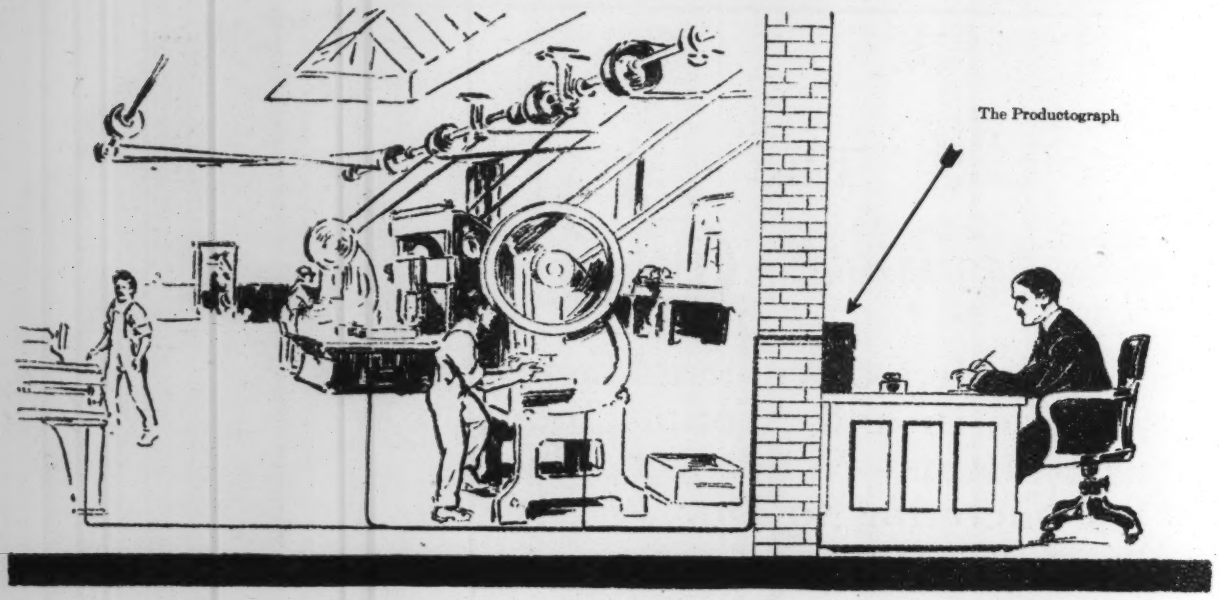
If you have concreting to do it will pay you to investigate our claims.

Write today for our 107 page booklet on the achievements of the Cement-Gun. Sent free upon request.

Cement-Gun Company

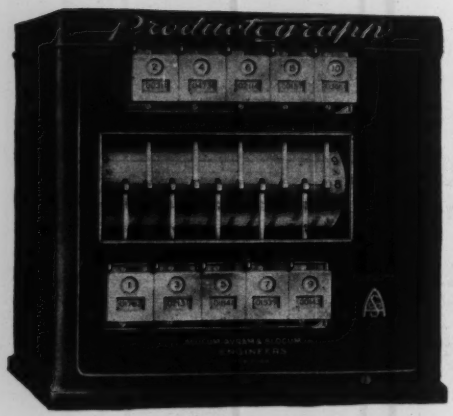
Incorporated

30 Church St. **New York**



Before you, on your desk, a continuous record of each machine's efficiency—

Mr. Manufacturer, think what that means to you. An accurate, indisputable, charted record before your eyes of just what each machine is doing every minute of the working day. It's bound to increase production, for every workman knows that your eye is on him and his machines even though you be sitting there at your desk. He works accordingly. The



Productograph

will raise efficiency because the rate of working—the stoppages, the feed, the speed of all your machines or machine tools is seen at a glance on the Productograph Chart.

It's a record that shows not only that there *is* waste motion, time lost—**but where.** You then know how to work up to 100% efficiency.

The Productograph is adapted to **any** machinery. In the shop—out on the job—on the steam shovel—dredging—anywhere. It will save its cost many times in one year.

Full details and information on request, telling just how you can profitably use the Productograph. WRITE US TODAY.

Slocum, Avram & Slocum, Inc.

Managing Engineers

30 Church St. **New York**

Please mention seeing this advertisement in Engineering News

Page 9—The Venturi Page
Series II.—Venturi Engineering News No. 4

Are This Summer's Heavy Drafts Taxing the Capacity of Your Water Works?

Venturi Meter Type M Register-Indicator-Recorder.

RIGHT now with the heaviest drafts of the year taxing the capacity of your water works, the importance of conserving the water supply is evident.

Increased demand may shortly necessitate the outlay of an enormous sum, unless the various sources of waste are eliminated.

Every gallon of water whether used or wasted must be delivered at an equal expense to the municipality or company.

Waste represents dollars lost in operation, maintenance and construction.

Can you afford to let this waste go on unchecked?

Venturi Meters

will save their initial cost many times over by accurately measuring every gallon of water passed into your distribution system. They enable you to determine the consumption per capita; district consumption; the efficiency of the pumping station and filtration plant; and immediately detect abnormal flows, caused by breaks in the mains, forgotten open valves, fire drafts, etc.

Observe the complete information imparted by the Type M Register-Indicator-Recorder shown by the illustration.

The Indicator Dial shows the rate of flow in "pounds per hour," "gallons per day" or other units at the moment of observation, and may be easily read to within 1/2 of 1%.

The Counter Dial shows the total gallons, pounds cu. ft., etc., which have passed through the meter tube.

The Chart Recorder Dial traces upon a 12" chart, rotated by clock work, an unbroken autographic record of all variations in the rate of flow from hour to hour. It is visible at all times and reveals the time and extent of any irregularity of flow.

Venturi Meters are installed in both large and small water works in all parts of this country and abroad. Twenty-three years of Venturi engineering experience are at your disposal to help you solve any hydraulic measurement problem.

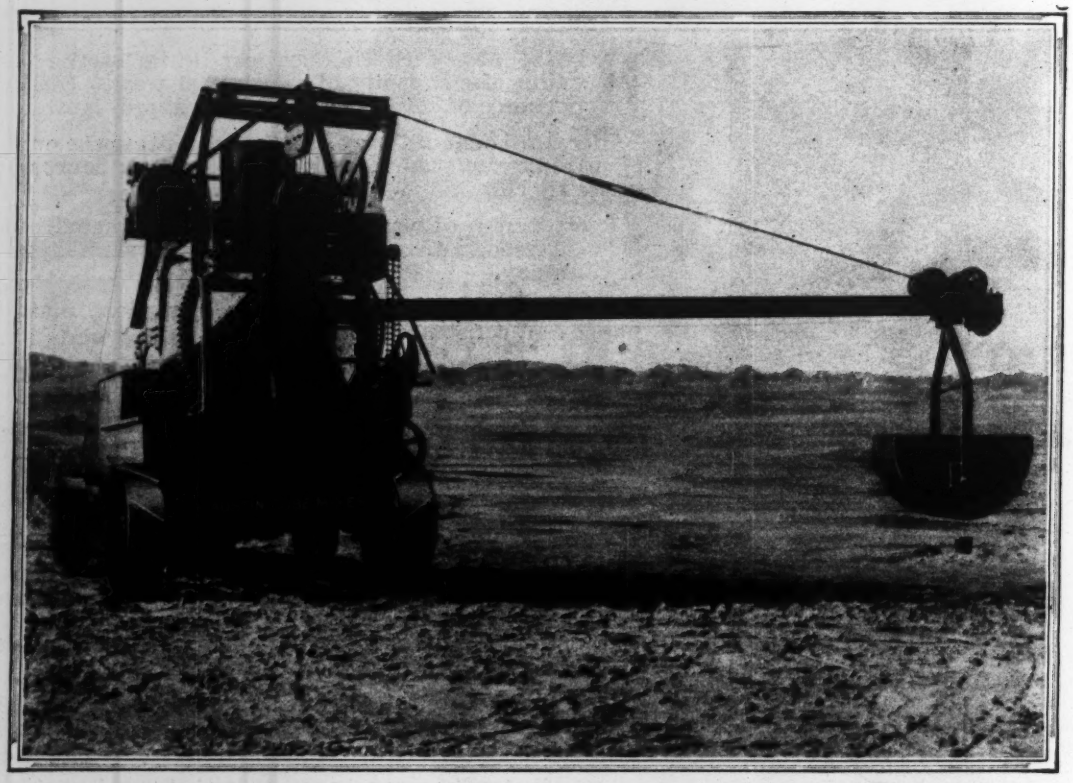
Let us send you a copy of Bulletin 6-N and an interesting 30-page catalog 75-N. Write today.

Builders Iron Foundry, Providence, R. I.

BRANCH OFFICES:—30 Church St., New York City. Northwestern Equipment Co., Alaska Building, Seattle, Wash. Northwestern Equipment Co., Railway Exchange, Portland, Ore. N. B. Livermore & Co., Merchants National Bank Building, San Francisco, Calif. The Rookery, Chicago, Ill.

THE AUSTIN CUBE PAVER

(*Gasoline or Steam Power*)



Record of seven consecutive days' work in Chicago of a

One-Bag Austin Cube Street Mixer

Six-Inch Concrete

Date	Sq.Yd. Daily	Total Sq.Yd.	Date	Sq.Yd. Daily	Total Sq.Yd.
May 13th	1360	1360	May 17th (Sunday)		
14th	1227	2587	18th	1340	6663
15th	1436	4023	19th	1365	8029
16th	1300	5323	20th	1350	9379

Average sq. yds. 1340. Average cu. yds. 223⅓.

This is record of contract work on pavement construction and is signed and sworn to by the **inspectors for the City of Chicago.**

Austin Special Street Mixers Built the Concrete Roads of Wayne County, Michigan.

Ask for catalog No. 2 and Street Mixer Booklet.

Municipal Engineering & Contracting Company

Eastern Office—30 Church St., New York City Main Office—Railway Exchange Bldg., Chicago

New England Agents: Dyar Supply Co., Cambridge, Mass.
Western Penn. and Eastern Ohio, J. S. Beckwith, Pittsburgh.
Baltimore—Charles A. Dollinger, 30 Bellair Ave.

Inter-Mountain District: Herbert N. Steinbarger, Denver, Colo.
Pacific Coast: The Lansing Co., San Francisco; The Beebe Co., Portland.

AGENTS WANTED IN OPEN TERRITORY.

"Watch It Grow"

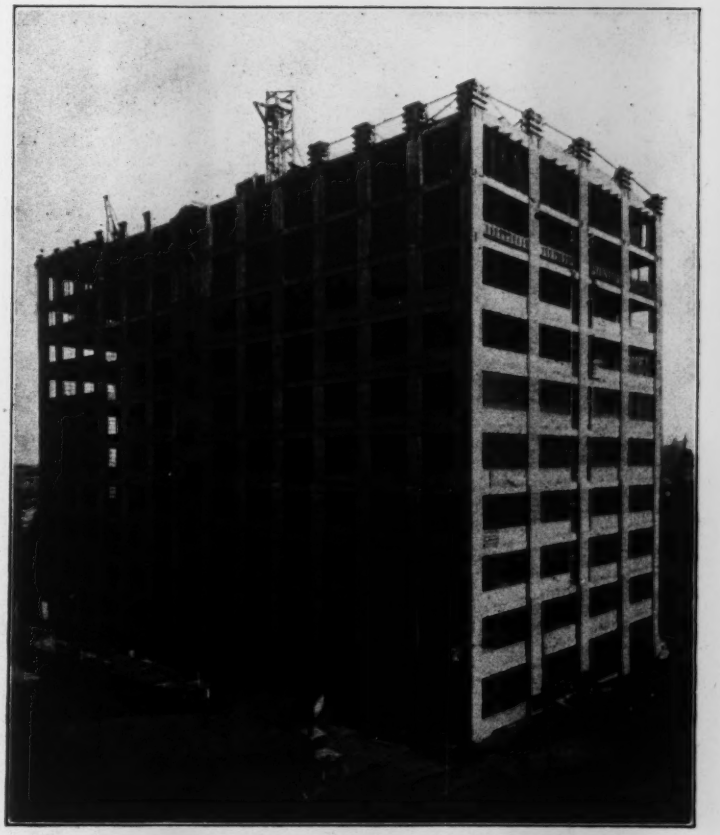
How One Ransome Mixer Helped to Build It—

(In Four Chapters)

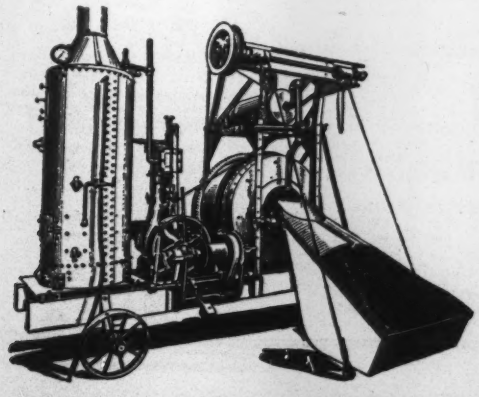
Chap. 4

This is How the Building Looked Jan. 2, 1913.

Here the ten stories of the Loft Building of the Hoboken Land & Improvement Co., Hoboken, N. J., are up. The ONE Ransome Mixer on the job is mixing its last batches. The roof was concreted five months after contract was signed; the building was delivered complete to the owners six and one half months from contract date.



Courtesy Turner Construction Co. Chas. Fall, Architect.



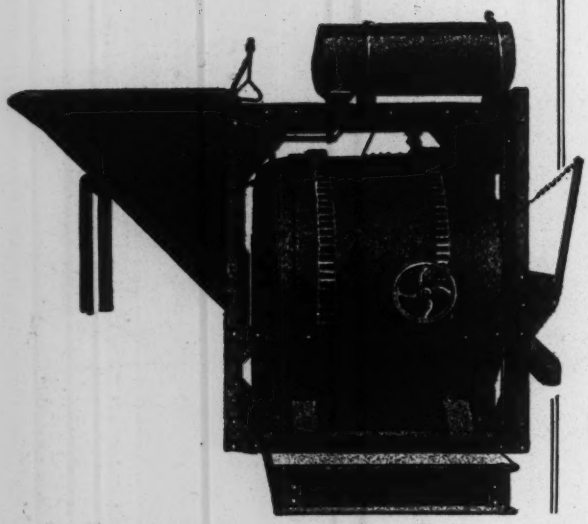
The "why and wherefore" of Ransome efficiency is given in full in the "Red Book."

Send for your copy.

Ransome Concrete Machinery Company

Dunellen **New Jersey**

Koehring QUALITY



What?

Skeptical about our claims for a mixer that mixes nearly three times as fast as any other—that has no repair cost for one year?

There are three proofs. Go to a contractor who uses a Koehring. Ask him.

Get in touch with a Koehring representative. Make him prove what he says the Koehring can save you on that job. He will.

Or get that Catalog D-19. Koehring construction speaks for itself.

Why not all three with the Catalog as a starter?

It means money saved.
WRITE NOW.

Koehring Machine Co., Milwaukee, Wis.

BALTIMORE, MD.,
Thomas M. Brown,
31 Knickerbocker Bldg

BIRMINGHAM, ALA.,
J. F. Donahoo,
6th Floor, Woodward Bldg.

BOSTON, MASS.,
F. O. Johnson,
70 Kilby Street

CHICAGO, ILL.,
Koehring Machine Co.,
G. E. Hillsmann, Dist. Mgr.
857 Peoples' Gas Bldg.

CINCINNATI, OHIO,
William T. Johnson & Co.
3rd Ave., and Vine St.

CLEVELAND, OHIO,
Bacon Eng. & Sales Co.,
Builders' Exch.

COLUMBUS, OHIO,
Koehring Machine Co.,
W. W. Williams, Dist. Mgr.,
507-509 Brunson Bldg.

DALLAS, TEXAS,
Southwestern Branch Koehring Machine Co., 1302 Southwestern Life Bldg.,
Leonard E. Baldwin, Dist. Mgr.

DES MOINES, IA.,
Contractors' Supply Co.,
419 Hubbell Bldg.

DETROIT, MICH.,
Good Roads Supply Co.,
1408 Ford Bldg.

GREENSBORO, N. C.,
E. F. Craven,
327 South Davie Street

KANSAS CITY, MO.,
Koehring Machine Co.,
F. P. Wilcox, Dist. Mgr.,
214 East 10th St.

KNOXVILLE, TENN.,
R. L. Harris,
210 Empire Bldg.,

MINNEAPOLIS, MINN.,
Koehring Machine Co.,
H. B. Jones, Dist. Mgr.,
350 Security Bank Bldg.

NEW YORK, N. Y.,
Koehring Machine Co.,
R. E. Brooks, Dist. Mgr.,
50 Church Street

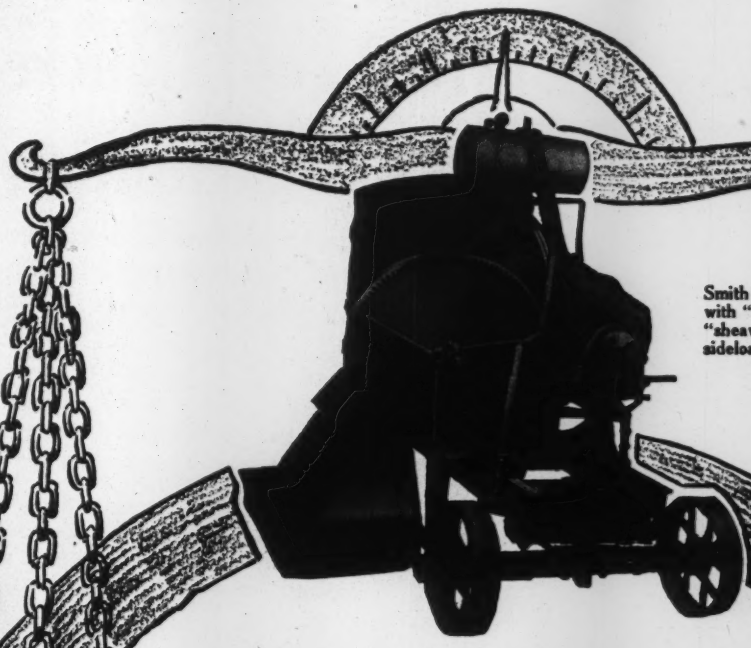
PHILADELPHIA, PA.,
Lee T. Ward Co.,
688 Bourse Bldg.

PITTSBURGH, PA.,
Chas. T. Topping,
Bessemer Bldg.

ROCHESTER, N. Y.,
H. B. Trevor Co.,
144 Cutler Bldg.

SAN FRANCISCO, CALF.,
Harron, Rickard & McCone,
139-149 Townsend St.

SEATTLE, WASH.,
Moran Engineering Co.,
1222 First Ave., So.



Smith "Mascot" Mixer with "ropeless" "sheaveless" geared sideloader.

WELL BALANCED MIXING

The production of concrete presents a two-sided problem. Quantity of output is easily obtainable, if Quality is ignored. Quality is not hard to reach, if time is sacrificed. But it takes a *mixer* to produce both Quality and Quantity. If you are satisfied with either one of the "Q's", without the other, there are other machines that will fill your requirements; but if you want to combine the two prime essentials of successful concrete work—use a

SMITH MIXER

It has the ideal structure for quick, reliable work. The cones slope toward the center. The materials are alternately moved to and away from the big diameter. This reciprocal action of the mass is combined with a rolling movement of the mass. The same long end-wise action is never obtained. except in a duo-cone drum. The mixing well done—you tip the drum to discharge the batch. Out it comes, in a thick, creamy, even stream. Ten seconds will empty the "Mascot." Fifteen seconds will dump the largest size. That's quick work; but you can verify our figures in the field any time you please.

"MASCOT" FEATURES—Holds 4 ft. wet concrete without splashing; steel truck; steel engine housing; enclosed type tank; geared type loader with no hoisting rope; enclosed gearing; no rollers. It's the simplest, handiest, most reliable young result-getter you'll find anywhere. **Use the coupon.**

BIG OUTPUT

SAFE MIXING

THE T. L. SMITH CO.

1126—32d Street
MILWAUKEE, WIS.

No 104 COUPON

Please send me a copy of your new 64-page Catalog No. 51-C, illustrating and describing the SMITH "MASCOT" MIXER.

NAME .....

ADDRESS .....

.....

The INSLEY METHOD of Concrete Distribution

Insley Spouting Plant at Deere Harvester Co., E. Moline, Ill. Henry W. Horst Co., Gen. Contractors, Rock Island, Ill. Equipment sold by R. H. Hyland & Co., Chicago.

Three *essentials* must be considered in placing concrete; the *cost*, the *quality* of concrete, and the *speed*.

The INSLEY METHOD of placing concrete by means of a hoisting tower and spouting gives average costs of about *half* the average costs by any other method.

The INSLEY METHOD assures quality of concrete, because none but properly mixed concrete will flow through spouting.

A RECORD OF 450 CU. YDS. placed in ten hours with a Standard Insley Plant is sufficient demonstration of the speed of this system.

Insley Equipment for Contractors

WE MANUFACTURE

CONCRETE SPOUTING PLANTS, HOISTS, TOWERS, HOPPERS, CARS, BUCKETS, and SPOUTING, CONCRETE HAND CARTS, SPREADER CARTS, TIP-OVER CARTS, COLUMN CLAMPS, ETC.

MONARCH BOTTOM DUMPING BUCKETS, SLACK LINE EXCAVATOR PLANTS, DRAG LINE BUCKETS, CAR SLIDE HOPPERS, STONE SKIPS, CABLEWAY SKIPS, ETC., ETC., ETC.

Controllable Bottom Dump Car.

Write our nearest agent for a copy of our catalog and prices.

SALES OFFICES:

W. E. AUSTIN MACHINERY CO.—Atlanta, Ga., Southern Sales Managers.
MUSSENS, LIMITED—Montreal, Quebec, Toronto, Cobalt, Winnipeg, Calgary, Vancouver, Halifax, St. John.
CHICAGO—R. H. Hyland & Co., 725 So. Dearborn St.
BOSTON—Dyar Supply Co., 66 Broadway, Cambridge, Mass.
NEW YORK—Knapp Machinery Supply Co., 120 Liberty St.
PHILADELPHIA—Henry T. Peirce, 704 Bulletin Bldg.
PITTSBURGH—Zeigler-Whaley Co., Keystone Bldg.
CLEVELAND—Tower Machinery Co., Garfield Bldg.
DETROIT—Wm. H. Cameron, 39 Buhl Block.
CINCINNATI—C. Taylor Handman, Merchants Bldg.
COLUMBUS, O.—T. L. Bissell Co., Hartman Bldg.
LOUISVILLE—W. E. Austin Machinery Co., 306 W. Main Street.
ST. LOUIS—Bronson Machinery Co., 1506 Chemical Bldg.
MINNEAPOLIS—Manf'rs Supply Co., 2401 University Ave., S. E.
DES MOINES—Contractor's Equipment Co., 422 Hubbell Bldg.
SALT LAKE CITY—Landes & Company, 301 W. South Temple.
KANSAS CITY—H. C. Darnell & Co., 408 Reliance Bldg.
SEATTLE—F. T. Crowe & Company, 411 Globe Bldg.
PORTLAND—F. T. Crowe & Company, 45 Fourth St.
SAN FRANCISCO—Lansing Company, 338 Brannan St.
RIO DE JANEIRO, BRAZIL—American Trading Co. of Brazil.
HONOLULU—Honolulu Iron Works, Honolulu, T. H.
YOKOHAMA, JAPAN—American Trading Co., 28 Yokohama.

ENGINEERS **INSLEY MFG. CO., Indianapolis** MANUFACTURERS

The Driveway Everlasting

Every view in this great structure is a lesson in the art of combining the beautiful with strength and stability. There is probably, among modern buildings, no better example of dignified, graceful and yet powerful construction.

This famous terminal, a sight-seeing point for visitors to New York, has been made imperishable. Two hundred and fifty thousand barrels of

ALPHA PORTLAND CEMENT

The High-Water Mark of Quality

were, after meeting the most exacting tests, used in its construction.

You can be sure that the grip of the concrete will be everlasting, that the structure will be imperishable, when ALPHA is specified and handled right, for every bag of ALPHA is guaranteed to more than meet all standard requirements.

ALPHA Cement represents 23 years of experience. ALPHA is tested hourly, day and night, by chemists and chemical engineers, whose authority in upholding quality is supreme.

Six great ALPHA plants on six trunk-line railroads; one plant with private docks directly on the Hudson River; capacity 25,000 barrels daily, storage for 2,000,000 barrels. Specify ALPHA and be sure of prompt shipments of properly burned, properly ground, properly aged cement at all times, and a service that is on a par with the high quality of ALPHA Cement.

Alpha Portland Cement Company

Branch Offices:

New York Chicago Philadelphia Boston Pittsburgh
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Maximum Strength with Minimum Corrosion

is the right combination for the ideal culvert. These are also, respectively, the star qualities of corrugated metal and American Ingot Iron. And when you combine the two in the form of a culvert you have realized the ideal culvert—

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"Armco" Culverts—American Ingot Iron—do combine maximum strength and minimum corrosion because of their ideal structure and material. "Armco" culverts will endure year after year for decades; and properly installed will successfully withstand any mechanical strain that your service may demand. Write the nearest manufacturer for full particulars and prices on

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Installed by us in plant of Great Northern Power Co., Duluth, in 1907. We are now building them a fourth line because they need more pipe and know Redwood Pipe Efficiency.

A 24-inch redwood stave pipe installed in Ogden Canyon by us in 1890 is still in daily use, as part of a power line, in perfect condition.

Let us quote you on your pipe requirements.

Redwood Manufacturers Co.

Fully Paid Capital $1,000,000.00.

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There Is As Much Difference

between this Trinidad Liquid Asphalt road and an ordinary oiled road as there is between wool and cotton.

Trinidad Liquid Asphalt has the stability of *Lake* asphalt; it *stays in the road* and builds up a durable, dustless asphaltic surface. There is no bleeding or greasy dust in Trinidad Liquid Asphalt roads.

Trinidad Liquid Asphalt costs little, if any, more than "road oils," and yet in its lightest form it is not a mere dust preventive, but an actual constructive agent.

With ordinary road oils reapplications are necessary to replace something that has entirely disappeared; while by the use of Trinidad Liquid Asphalt successive applications build up a durable bituminous surface very closely resembling that of a sheet asphalt pavement.

For park drives, private roadways and town streets, as well as for country roads, Trinidad Liquid Asphalt provides an ideal means for superficial road treatment and resurfacing. Applied hot or cold.

For further information address

The Barber Asphalt Paving Company

PHILADELPHIA, PA.

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DUNN Wire-Cut-Lug BRICK

Ideal Paving Material

For Factory Yards and Driveways

Ideal because—sanitary, cracks do not form and hold filth; dustless, no crumbling action that fills the air with fine particles; perfect traction, the grout and brick form a monolithic structure; low upkeep, it stays put without constant repairs.

Wire-Cut-Lug Brick is perfect brick because laminations are not caused as by repressing. Every lug is cut—therefore every brick is even and perfect, free from fractures and of great strength.

The perfect lugs permit of easy alignment and hold the courses so that when the grout is applied it flows evenly between the interstices of the bricks.

Their rough wire-cut sides grip the cement, and sharp wire-cut edges hold it even with the surface.

The result is a monolithic surface—smooth and even and it is not slippery.

The licensees listed below are independent, competing brick makers. They have proved they can make good brick—they can supply you with Wire-Cut-Lug Brick—that will make perfect, lasting pavement. Write for information.

Dunn Wire-Cut-Lug Brick Co.

CONNEAUT, OHIO

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United Brick Co.	Conneaut, Ohio
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Danville Brick Co.	Danville, Ill.
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The McAvoy Vitrified Brick Co.	Philadelphia, Penn.
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Hocking Valley Brick Co.	Columbus, Ohio

Wire Cut Lug Wire Cut Lug

"Nasty, Filthy Creosoted Wood Block Street"

The Complaint—The Cause—The Remedy

The Complaint

Mr. Engineer, Read These Letters;

"One Mass of Filthy Tar"

————Ia., May 30, 1914

————Company.

Gentlemen:—

Last year there was constructed in this city about ten blocks of creosoted wood paving. The writer is one of the parties who are responsible for the adoption of this class of paving and, therefore, much interested in its success.

Since the warm weather has arrived this pavement **is one mass of filthy tar that is tracked onto the sidewalks, into stores and dwellings, and sticks to the shoes of pedestrians, causing damage to carpets, rugs, tile floors, ruining dresses and clothing in general.** The daily papers are incessantly calling attention to the deplorable condition of this wood block street.

My purpose in writing to you is with the hope that you may be able to suggest some remedy for relieving this deplorable condition. We would appreciate any suggestions you may have to offer.

Very truly yours,

J. W. C.

"The Worst Mess I Have Ever Seen"

————Wis., June 2, 1914

————Company,

Dear Sirs:—

The creosoted wood block paving in .....Avenue, furnished by the————company, is the worst mess I have ever seen. The city engineering department is working manfully to keep the pavement cleaned up, and they have taken tons and tons of muck off the street and hauled it away. **They put road scrapers on it and scraped off the tar that oozed out, but it still keeps oozing.**

In places where this sticky stuff has not been scraped off, they have spread a quantity of sand and gravel. These have mixed with the tar and the **last condition is worse than the first.** This combination has made a nasty, uneven mess on top of the blocks so that riding over them is worse than traveling over a badly worn macadam road.

They tell us **that all creosoted wood block streets are like this the first season.** Is this so?

Very respectfully yours,

C. A. L.

The Cause

MR. ENGINEER: If you have creosoted wood blocks in your streets that are "BLEEDING," SWELLING or "BLOWING UP" these defects are due to one of two causes, or both:

1. INFERIOR, LOOSELY DRAWN or UNSCIENTIFIC SPECIFICATIONS or
2. YOUR SPECIFICATIONS HAVE BEEN VIOLATED AND THE WOOD PRESERVATIVE ADULTERATED.

NONE OF THE CONDITIONS COMPLAINED OF IN THE LETTERS QUOTED ABOVE CAN EXIST IN A WOOD BLOCK STREET IF THE SPECIFICATIONS HAVE BEEN PROPERLY DRAWN AND FAITHFULLY CARRIED OUT.

Tar has no place in a creosoted wood block. When tar masquerades under the name of creosote its presence is quickly made evident under the rays of the first hot sun in a sticky, oozing mass of nasty tar. This action continues while any tar remains in the block. The blocks having lost any waterproofing properties the tar preservative contained, absorbs moisture, swell and expand and the "blow-up" of the street follows.

The Remedy

The Reilly Improved Kreodone Creosote Oil is the Acme of all wood preservatives. Wood blocks preserved with it will not bleed, buckle or blow up.

This improved creosote oil absolutely contains no tar. It is a pure distillate of high specific gravity.

It is the richest in preservative qualities. It is fixed, permanent and stable in its effects.

A wood block treated with the Reilly Improved Kreodone Creosote is thoroughly waterproofed during its mechanical life, and the greatest permanency is obtained.

The Specifications

Mr. Engineer: We want you to have a copy of the specifications for the **Reilly Improved Kreodone Creosote.** You owe it to yourself and your profession to have a copy in your files. They are "open specification." Any manufacturer can meet them. The crude material is ready to give up this high gravity preservative if the manufacturer will go after it.

Adopt these specifications and always have clean, durable, handsome and sanitary streets. **Not a sea of nasty, sticky tar.** Your copy is waiting for you. A postal will bring it to you. **Send for it today.**

Republic Creosoting Company

Main Offices; Indianapolis, Ind.

Plants: Mobile **Indianapolis** **Minneapolis**

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Pihl and Miller, Contrs., Pittsburgh, Pa.

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Blaw Light Wall Forms can be used on light concrete walls of any height or length. The same forms work just as well on house foundations as on warehouses, piers, coaling stations, retaining walls, etc. They can be leased or purchased.

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When a $\frac{5}{8}$ inch wire rope holds up on a 5-inch drum all question of our flexibility contention must be swept aside. Strength, too, enters in a test like this as a moment's consideration of the size of the drum will show. Read this letter and be convinced that "Yellow Strand" gives real rope service.

"The Government Engineer here on his derrick scow, has found that a $\frac{5}{8}$ inch *Yellow Strand* rope has given him better satisfaction than any other rope he has used, owing to the size of the outfit it is impossible for them to use any longer drums than the one in use, 5 inches. They therefore have to put up with considerable breakage of rope, but as before stated, your rope has always given them better satisfaction than any other." Portage Lake Hardware Co., Ltd., Houghton, Mich. J. J. Zealand.

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Branches—Seattle, New York.

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are adapted to all conditions of capacity and head, for all methods of drive, as by electric motor, water wheel or steam turbine.

The De Laval High Duty Turbine-driven Pump is operated at the proper speed through the use of the De Laval Speed Reducing Gear, permitting the turbine and pump to be run at the best speed for efficiency, simplicity, and long life. This results in attainment of duties comparable with those of compound condensing, reciprocating engines even approaching those of triple-expansion engines.

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If you are interested in pumping questions, send for our new 300-page Treatise B-41.

DE LAVAL

Steam Turbine Company, Trenton, N. J.

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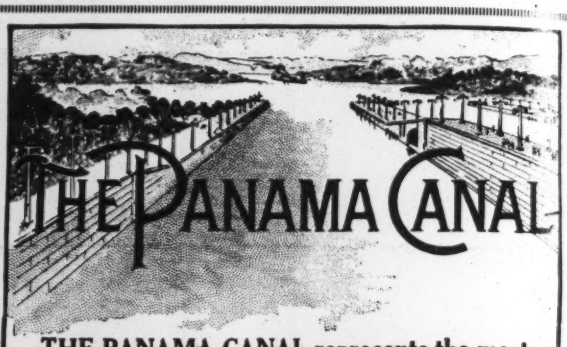

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Exceptional strength and accessibility are featured in their design.

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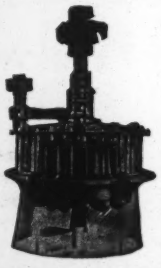
Drive Your Generator With A Samson Turbine



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Samson turbines use the water economically; the speed is quick and steady; they develop great power. Write us today.

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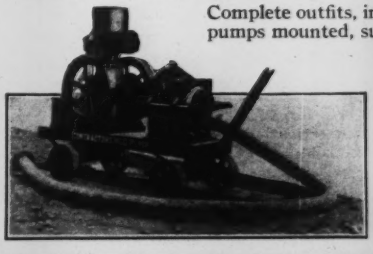

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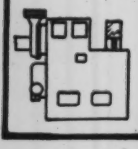

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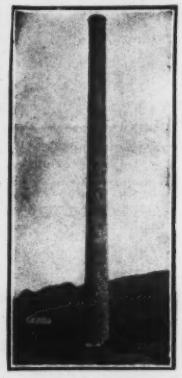

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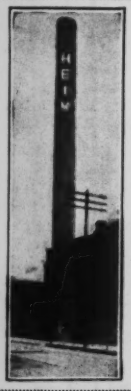

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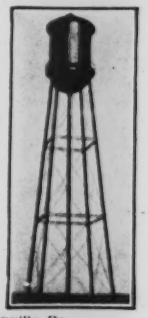

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For 58 years we have been manufacturing the highest quality cast iron pipe and special fittings.

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Bell-holes practically eliminated.
Trench pumping expense reduced to minimum. Work finished on time.
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Leadite lessens labor. It fills every crevice from the yarn to face of bell. It is the efficient joint.

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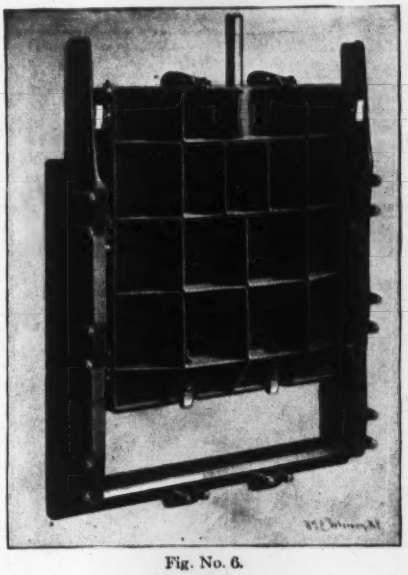

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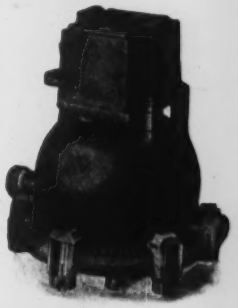

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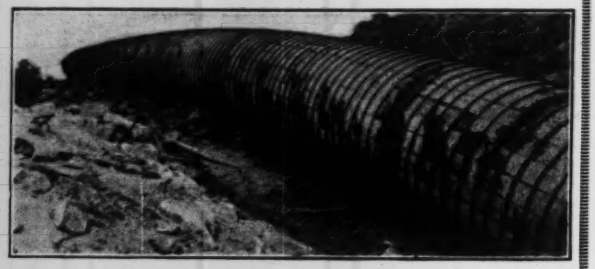

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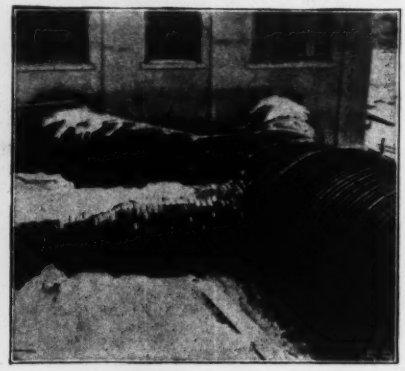

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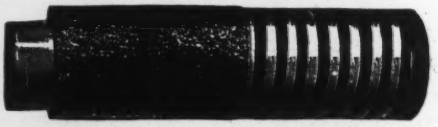

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Size for size, it carries 14% more water than iron pipe.
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are the cheapest you can buy. You will find that they will give you real economy no matter what the job. Their uses are numberless. Work in wet or dry rock—anywhere. There's a minimum expense for labor, power and repairs.

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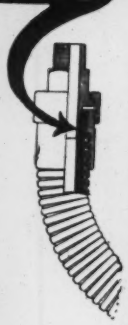
Note this leak-proof coupling



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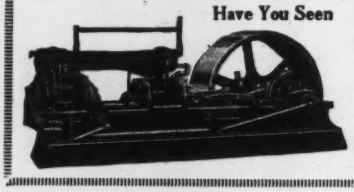

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For Road Work

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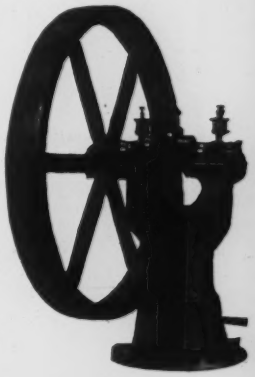

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are admirably suited to this service. They are particularly adapted for charging storage tanks for operating small pneumatic tools, general machinery cleaning, automobile garage use, or wherever compressed air in small quantities is required.

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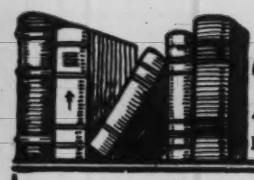

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The Highway Engineer

at this season of the year is busily engaged in the improvement of highways and streets. It is part of his work to be well posted on the up-to-date literature covering this subject. The following publications set forth the latest practice and are worthy of a place in the engineer's library.

Text-Book on Highway Engineering

By **Professor Arthur H. Blanchard** and **Henry B. Drowne**, Department of Highway Engineering, Columbia University in the City of New York.

The broad scope of this book and its reference to materials, construction, maintenance, specifications and cost data make it a comprehensive reference book upon the subject of highway engineering for the engineer. The writings of eminent engineers and chemists have been drawn upon in order to transmit directly to the reader the views of experts on special subjects.

762 pages, 6 x 9, 234 figures and 4 charts. Cloth, $4.50 net.

Dust Preventives and Road Binders

By **Prevost Hubbard**, Assistant Chemist, Office of Public Roads, U. S. Department of Agriculture.

Gives the road engineer a working knowledge of the characteristic properties of dust preventives and road binders now in use, and develops certain fundamental principles relative to their selection and application.

416 pages, 6 x 9 , 51 figures. Cloth, $3.00 net.

Fourth Edition, Revised and Enlarged

Text-Book on Roads and Pavements

By **Professor Frederick P. Spalding**, Department of Civil Engineering, University of Missouri.

In this edition the author has practically rewritten the entire book. New chapters have been added on Bituminous, Macadam and Concrete Pavements, and modifications have been made of the chapters on Brick, Asphalt and Wood Pavements.

408 pages, 6 x 9, 51 figures. Cloth, $2.00 net.

Second Edition, Revised and Enlarged.

Street Pavements and Paving Materials

By **George W. Tillson**, C.E.

A manual for city pavements, the methods and materials of their construction.

In this edition has been included a chapter called "The Protection of Pavements," to which serious attention must be given in this country where there is so much subsurface street construction.

651 pages, 6 x 9, 96 figures. Cloth, $4.00 net.

Second Edition, Enlarged.

A Treatise on Roads and Pavements

By **Professor Ira O. Baker**, C.E., D. Eng'g, University of Illinois.

This edition contains a chapter on Automobile Roads and Concrete Pavements. This greatly enhances the value of this book when we consider the remarkable increase in the number and power of automobiles during the past decade which has led to the development of new forms of road surfaces designed to resist motor traffic.

698 pages, 6 x 9, 171 figures, 72 tables. Cloth, $4.50net.

Other Books for the Highway Engineer

Taylor-Thompson—Concrete Costs

By **Frederick W. Taylor**, M.E., Sc.D., and **Sanford E. Thompson**, S.B., Mem. Am. Soc. C. E., Consulting Engineer.

This book is based on a long and most careful investigation of construction methods. It gives unit times for each element of the work so that it will be possible for a person in any locality to apply the local costs of labor to the data in the book and obtain results much more accurate than could be obtained from the common methods of estimating. The highway engineer will find in this book many valuable suggestions which will prove readily applicable to his work.

709 pages, 5¼ x 8, 82 figures. Cloth, $5.00 net.

Tracy—Plane Surveying

By **Professor John Clayton Tracy**, C.E., Sheffield Scientific School of Yale University.

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Construction News

★ Denotes work advertised in ENGINEERING NEWS.
✚ Denotes contract awarded. The names of bidders awarded contracts are set in CAPITALS.

RAILWAYS

New York—(Borough of Queens)—Long Island R.R.—This company has been ordered by the Public Service Commission to double-track its line on New York Ave., between South St. and Farmers Ave., Borough of Queens. G. B. Gunn, Jamaica (L. I.), N. Y., is Supt. of Const.

Pennsylvania—Berks & Lancaster Ry.—This company was chartered June 15, with $200,000 capital, to construct a line from Lititz, Lancaster County, to Womelsdorf, Berks County, Penn.

Pennsylvania R.R.—This company plans to construct an entire new line from Lovelis to Corry, Penn. Bids are being received. Alexander C. Shand, Philadelphia, Penn., is Ch. Engr.

West Virginia—Baltimore & Ohio R.R.—This company, it is reported, plans to construct a branch line from Fairmont, W. Va., to Palatine, W. Va. F. L. Stuart, Baltimore, Md., is Ch. Engr.

North Carolina—Maxton, Alma & Southbound R.R.—This company plans to construct an extension about 75 miles long. A. J. McKinnon, Maxton, N. C., is Pres.

Central Carolina R.R.—Elections on the issuance of bonds for $95,000 each to aid this company in the construction of its proposed line have been authorized to be held in Hallsville, Boulahville, Limestone and Wolfcrape Townships. The company proposes to construct from Lillington, N. C., to Swansboro, N. C., 110 miles. W. J. Edwards, Sanford, N. C., is interested. Noted June 18.

Georgia—Southern Ry.—The Georgia Railroad Commission has granted the application of the Atlanta & Charlotte Air Line Ry. (Southern Ry.), to issue $20,000,000 in bonds for second-track work from Charlotte, N. C., to Atlanta, 260 miles. W. H. Wells, Washington, D. C., is Ch. Engr. Const. Noted June 8 under North Carolina.

Atlanta, Birmingham & Atlantic R.R.—This company has been sold to the bondholders. It is reported that it will be reorganized under the name of the Atlanta, Birmingham & Western R.R. Plans for reconstruction work are under consideration. E. T. Lamb, Atlanta, Ga., is Gen. Mgr.

Alabama—Alabama Great Southern R.R.—This company will award contracts in about four weeks for second-track work from Birmingham, Ala., to Mobile Junction, Ala., 14 miles, and from York, Ala., to Meridian, Miss., 28 miles. C. Dougherty, Cincinnati, Ohio, is Ch. Engr.

Mississippi—Alabama Great Southern R.R.—See item under Alabama.

Louisiana—Vicksburg, Alexandria & Southern Ry.—This company, it is reported, plans to award all contracts soon for the construction of its proposed railroad across Louisiana from northwest to southeast. J. F. Sheply of the St. Louis Trust Co., St. Louis, Mo., is Pres.

Tennessee—Holston Valley Ry.—See item under Electric Railways.

✚**Kentucky**—Norfolk & Western Ry.—This company has awarded the contract to MASON & HANGER, Lexington, Ky., for the construction of a second main track from Waverly to Disputanta, Ky. J. E. Crawford, Roanoke, Va., is Ch. Engr.

✚**Kentucky**—Illinois Central R.R.—This company has awarded contracts as follows for grade reduction work in Kentucky: 500,000 cu.yd. near Iron Hill, Ky., to the WALSH CONSTRUCTION CO., Davenport, Iowa; 400,000 cu.yd. at Delancey, Ky., and 70,000 cu.yd. at Grand Rivers, Ky., to WINSTON BROS., Minneapolis, Minn.; 120,000 cu.yd. near Princeton, Ky., to H. D. HODGES, Birmingham, Ala.

Kentucky—Wasioto & Black Mountain R.R. (Louisville & Nashville R.R.)—This company plans to construct a 16-mile extension into the Letcher County, Ky., coal fields. H. C. Williams, Louisville, is Ch. Engr. Const.

Ohio—Tri-State Rys. Co.—See item under Michigan.

Michigan—Tri-State Rys. Co.—This company is making surveys for its proposed 18-mile line from Hillsdale, Mich., south to Pioneer, Ohio. This is a portion of the company's proposed line from Adrian, Mich., to Elkhart, Ind.

The same company is considering the construction of a branch from Adrian, Mich., to Jackson, Mich.

Minnesota—Northern Pacific Ry.—This company plans to construct a branch line from Beach, N. D., 25 miles southeast in Golden Valley. W. L. Darling, St. Paul, Minn., is Ch. Engr.

Minneapolis & Central Minnesota Ry.—This company will award the grading contract soon for its proposed railroad from St. Cloud, Minn., to Minneapolis, Minn. E. G. Potter, Minneapolis, is interested.

Kansas—North & South Ry.—This company has been incorporated with a capital of $500,000 for the purpose of constructing a railroad, 200 miles long, from Wichita, Kan., to Concordia, Kan., and Washington, Kan. J. R. Burton, Salina, Kan., is interested.

North Dakota—Northern Pacific Ry.—This company plans to start work soon on its proposed railroad from Mott, N. D., to Beach, N. D. W. L. Darling, St. Paul, Minn., is Ch. Engr.

Montana—Butte, Wisdom & Pacific R.R.—The MacArthur-Perks Co., New York, N. Y., and Chicago, Ill., plans to start work in August on this company's proposed line from Divide, Mont., to Jackson, 128 miles. Noted June 11.

Missouri—Chicago & Alton R.R.—This company has applied to the Missouri Railroad Commission for permission to issue $585,000 in bonds for improvements to its lines in Missouri. H. T. Douglas, Jr., Chicago, Ill., is Ch. Engr.

Texas—Beaumont & Great Northern R.R.—(Missouri, Kansas & Texas Ry.)—This company, it is reported, plans to construct an extension from Weldon, Tex., to Bremond, Tex., 75 miles, to connect with the Houston & Texas Central R.R. A. M. Acheson, Dallas, Tex., is Ch. Engr. M. K. & T. Ry.

✚**Washington**—Oregon-Washington R.R. & Navigation Co.—This company has awarded the contract to TWOHY BROS., Portland, Ore., for constructing its proposed line from Chambers Prairie Station to Olympia, Wash., 7½ miles.

California—San Diego & Arizona Ry.—This company, with offices in the Union Bldg., San Diego, Calif., is asking for bids on 46.21 miles of grading and tunneling in San Diego County, from a point near the international boundary line west of Campo easterly to the vicinity of Carriso Pass. The bids must be in not later than June 30. The distance has been divided into four contracts, one of which will take in the Carriso Gorge, where there are 18 tunnels aggregating 22,000 ft. and stretches of very heavy work. Contractors are invited to bid on one or all contracts. E. J. Kallright, San Diego, is Ch. Engr. Noted June 18.

The Business Stability Association of Pasadena, Calif., it is reported, has approved a plan to construct a railroad between Los Angeles, Calif., and Pasadena. It will be part subway and part elevated. T. D. Allen, Comr. of Pub. Wks., Pasadena, is interested.

Alberta—Western Dominion Ry.—This company plans to award contracts this summer for its proposed 202-mile railroad south from Calgary, Alta. L. K. Jones is Asst. Deputy Minister and Secy Dept Rys. and Canals, Ottawa, Ont.

Alberta—Canadian Northern Ry.—This company plans to start work in July for grading work from Hanna to Medicine Hat, Alta. M. H. MacLeod, Winnipeg, Man., is Gen. Mgr. and Ch. Engr.

British Columbia—Northern Pacific Mines, Ltd.—This company, of Prince Rupert, B. C., will construct a 38-mile railway to develop several hundred acres of iron-ore land. Capital, $600,000.

ELECTRIC RAILWAYS

Milford, Mass.—The Dedham & Medfield St. Ry. and the Medfield St. Ry., the latter having suspended operations in October, were bought recently by a new corporation, the Dedham & Medway St. Ry. Co., and will be operated by the Milford & Uxbridge St. Ry. Co. The total length of the system taken over is 21 miles and of this 14 miles will need considerable rebuilding, as it has not been operated for eight months. Walter L. Adams is Gen. Mgr. of the Milford & Uxbridge Co.

Bridgeport, Conn.—The Wilkenda Land Co., 214 Newfield Bldg., Bridgeport is receiving bids for the construction of about three miles of electric railway from Stratford to Lordship Manor on the Sound.

Buffalo, N. Y.—The International Ry. Co. has applied to the City Council for a franchise to construct an electric railway on Tracy St. to connect the Grant St. line with the Elmwood and Hoyt St. lines. J. A. McKenna, Buffalo, is Secy.

Keansburg, N. J.—The City Council has granted a franchise to the Jersey Central Traction Co. to extend its line on Palmer Ave. to the landing of the Keansburg Steamboat Co. Samuel Barnes, Keyport, is Gen. Supt. and Pur. Agt.

Mount Holly, N. J.—The Public Service Ry. Co. is considering the construction of a line from Mount Holly to Hammonton, via Medford, Lumberton, Indian Mills and Atsion. R. E. Danforth, Newark, is Gen. Mgr.

Newark, N. J.—The Public Service Ry. Co. has made application to the Board of Works for traction franchises as follows: Rector St., single track line; Parkhurst St., single track line, and in Park Place, double track line. R. E. Danforth, Newark, is Gen. Mgr.

Grove City, Penn.—A franchise has been granted to the Northwestern Traction Co. for the construction of an electric railway through Grove City. This is part of a proposed line to connect Grove City and Slippery Rock. Thomas H. Greer, Butler, is interested. Noted May 7.

Buckhannon, W. Va.—F. H. Shanley, Cincinnati, Ohio, is interested in the construction of an electric railway from Buckhannon to Weston to connect with the proposed trolley line from Clarksburg to Philippi.

Charleston, S. C.—Plans are being considered by the Charleston Consolidated Ry., Gas & Lighting Co. for the construction of an electric railway through Chicora Park, North Charleston. George H. Waring, Charleston, is Vice-Pres. and Gen. Mgr.

Bristol, Tenn.—The Holston Valley Ry. Co., Bristol, Tenn., will convert a 12-mile steam road to a traction line. A power plant will be built at Bristol.

Lancaster, Ohio—The City Council has granted a franchise to the Lancaster Traction & Power Co. for a period of 25 years to extend several of its lines in Lancaster. H. B. Peters, Lancaster, is Pres., Gen. Mgr. and Pur. Agt.

Springfield, Ohio—The Springfield Ry. Co. will extend its line on Lowrey Ave. George C. Towle, Dayton, is Gen. Mgr.

Youngstown, Ohio—According to press reports, H. W. Davis is interested in the construction of an electric railway from Youngstown to Canfield.

Detroit, Mich.—The Detroit United Ry. Co. will construct an electric railway in the Fourth Ward. F. W. Brooks, Detroit, is Gen. Mgr.

Grand Rapids, Mich.—The Grand Rapids Ry. Co. has been granted permission to extend its line on Madison Ave. from Hall St. to Burton Ave. W. E. Livingston, Grand Rapids, is Pur. Agt.

Aurora, Ill.—The Aurora, Plainfield & Joliet Ry. Co. has been incorporated to operate an electric railway from Aurora to Plainfield and Joliet. The incorporators are W. A. S. Mulligan, J. C. Hauronic, Robert Oehmig, O. P. Steward and Frank P. Page.

✚Watertown, Minn.—The Electric Short Line R.R. Co. has awarded a contract to ROUFS & PFLEGHAAR CO., Minneapolis, for grading its electric railway from Watertown to Winsted.

Casper, Wyo.—The City Council has granted a franchise to John B. Fleming to construct and operate an electric railway in Casper.

Fulton, Mo.—F. S. Mordaunt, of Chicago, Ill., proposes to construct an electric road from Fulton to Montgomery City and Columbia, with a city system there, and extend it to Jefferson City.

Fort Worth, Tex.—The Fort Worth Southern Traction Co. has been granted permission to change its name to the Tarrant County Traction Co. This company will build an electric interurban line from Fort Worth to Denton. George H. Clifford is Gen. Mgr.

F. W. Ferguson is interested in the project to construct an electric interurban railway from Fort Worth to Mineral Springs, about 60 miles.

Orange, Tex.—A. M. Hodges and associates, Orange, have been granted a franchise to construct and operate an electric railway in Orange. Noted June 4.

Port Arthur, Tex.—The Pier Ry. Co. has been incorporated to construct and operate an electric railway in Port Arthur. The incorporators are J. W. Williams, K. M. Smith and C. N. Bosler.

Temple, Tex.—The City Council has granted a franchise to the Southwestern Traction Co. for the construction of an electric street railway on certain streets of the city. The local system will be operated in connection with the interurban line of the company that will connect Waco and Austin. Noted June 18.

Tucson, Ariz.—According to press reports a company is being organized to construct a 13-mile electric railway in Tucson from Stone St. to Pastime Park.

Seattle, Wash.—The Puget Sound Traction, Light & Power Co. contemplates the construction of a street railway on Ravenna Blvd. E. C. Gaumnitz, Seattle, is Pur. Agt.

San Bernardino, Calif.—Plans are being considered by the Pacific Electric Ry. Co. for the reconstruction of its electric railway from Highland to San Bernardino. F. W. Taylor, Los Angeles, is Pur. Agt.

✚San Francisco, Calif.—The Board of Public Works has awarded a contract for the installation of the overhead electrical conductors for the municipal railway line to H. S. TITTLE, at $36,245.

San José, Calif.—The San Francisco-Oakland Terminal Rys. Co. contemplates the construction of an electric line from Bay Farm Island to San José. The cost of this and the proposed ferry system will be about $2,225,000. Andrew W. McLimont is Gen. Mgr.

Hamilton, Ont.—The Wentworth County Council has granted a franchise to the Hamilton Street Ry. Co. to construct and operate an electric railway on Main St. from Ottawa St. to Kenilworth Ave. Edward P. Coleman, Hamilton, is Gen. Mgr.

Windsor, Ont.—The International Suburban Ry. Co. is being organized for the purpose of constructing an electric railway through Essex and Kent Counties, Ont., and to connect by a ferry with Detroit, Mich. Rodd, Wigle & McHugh, Windsor, are interested.

Medicine Hat, Alta.—The City Council contemplates the construction of an electric railway along the Ansley Spur to the West Industrial site, about 3½ miles.

LIGHT, HEAT AND POWER

✚Boston, Mass.—The contract for installing the heating and ventilating apparatus in the Wells School has been awarded by the Schoolhouse Commission to the P. J. SULLIVAN CO. at $13,250: Other bids were: J. J. Hurley & Co., $13,975; Power, Heating & Ventilating Co., $14,095; J. P. Dwyer Co., $14,441; Laskey & McMurrer, $15,560; Joseph P. Lomasney, 120 Boylston St. is Chn. of Comn.

Fayville, Mass.—The Metropolitan Water & Sewerage Commission of Boston contemplates the construction of an electric plant at the Fayville Dam to cost about $125,000.

Great Barrington, Mass.—The Great Barrington Electric Light Co. will extend its transmission line from Great Barrington to Ashley Falls. P. A. Russell, Great Barrington, is Vice-Pres. and Mgr.

Manchester, Conn.—Cheney Bros. are considering plans for the construction of a power plant in connection with their silk mills at Manchester.

✚Seymour, Conn.—WILLIAM HARRIS has been awarded the contract for the construction of a substation at Seymour and the extension of the transmission line from Waterbury to Seymour.

New Hope, Penn.—The Bucks County Electric Co. has applied to the Borough Council for permission to install a local electric-light and power system. W. H. Janney, Newtown, is Mgr.

Seward, Penn.—According to press reports the Citizens Light, Heat & Power Co., Johnstown, contemplates the establishment of a central power plant at Seward. P. J. Morrisey, Johnstown, is Gen. Mgr.

★Tarentum, Penn.—(Official)—Bids will be received by the Borough Council until July 13 for the construction of a reinforced concrete power house. Leo Hudson, House Bldg., Pittsburgh, is Consult. Engr. W. A. Gibson is Borough Secy.

West Chester, Penn.—Plans are being considered for the construction of a municipal electric-light plant at West Chester.

Hot Springs, N. C.—The Industrial Power Co. recently incorporated will establish an electric power plant.

Abingdon, Va.—According to press reports the Abingdon Water & Power Co. contemplates the construction of a power dam at the middle fork of the Holston River near Abingdon. J. H. Hines, Abingdon, is Secy. and Mgr.

Bay Minette, Ala.—Plans are being prepared for the construction of a municipal electric-light plant. J. M. Franklin is Clk.

Burkesville, Ky.—George H. Greenup will establish an electric-light plant and water system at Burkesville.

Louisville, Ky.—The Louisville Gas & Electric Co. contemplates the expenditure of $478,361 for constructing an extension to its plant on Washington St.

Cleveland, Ohio—Bids will be received at the office of the Commissioner of Purchases and Supplies, Room 513, City Hall, until noon, July 3, for electric meters for the municipal electric-light plant. F. W. Ballard, is Comr., Dept. of Heat and Light.

Mason, Ohio—An expenditure of $14,000 is planned for the improvement and extension of the municipal electric-light plant.

✚Anderson, Ind.—Bids have been received by the Board of Public Works for the installation of an ornamental street-lighting system as follows: FISHER-ZAHN ELECTRIC CO., Toledo, Ohio, $14,551, (awarded contract); Kokomo Electric Co., Kokomo, $15,329; Hatfield Electric Co., Indianapolis, $16,170; Richmond Electric Co., Richmond, $16,548; Gangle, Harbough Co., Akron, Ohio, $17,145; U. M. Nasbaum, Fort Wayne, $17,735; W. H. Ochletree, Pittsburgh, Penn., $18,130; Powell & Dorste, $18,150; D. H. Durbin, Anderson, $20,753; Freeman-Sweeney Co., Chicago, Ill., $23,915; Sanborn Electric Co., Indianapolis, $26,500. Noted May 14.

Centerville, Ind.—Bids will be received by the Board of Commissioners of Wayne County, Richmond, Ind., until June 27 for constructing a transmission line from Centerville to the County Poor Farm and for installing an electric system in the poor farm buildings.

Tell City, Ind.—The city has decided to issue bonds for $17,000, the proceeds of which will be used for improving its electric-light plant.

Grand Rapids, Mich.—The Sixth Ward Improvement Association will install an ornamental lighting system on West Leonard St. to cost, $8000.

Havana, Ill.—The Commercial Club is considering plans for the installation of an ornamental street-lighting system.

Spring Valley, Ill.—The Illinois Public Utilities Commission has granted permission to the Spring Valley Utilities Co. to construct an electric-light and power plant at Annawan and for the extension of its transmission lines to Mineral.

✚Sterling, Ill.—The contract for the installation of an ornamental street-lighting system has been awarded to the ELECTRICAL CONSTRUCTION & MACHINERY CO., Rock Island, at $7997. Noted Apr. 23.

Trempealeau, Wis.—Bonds for $8000 have been voted the proceeds of which will be used for the construction of a municipal electric-light plant.

Esterville, Iowa—See item under "Water Supply and Irrigation."

Hills, Minn.—Bids will soon be received for the construction of a municipal electric-light plant. Earl D. Jackson, Capitol Bank Bldg., St. Paul, is Consult. Engr.

Pine River, Minn.—The Pine River Electric Co. contemplates the extension of its transmission line to Backus.

Dayton, Tex.—The Dayton Light & Power Co., which has been recently organized will construct an electric-light and power plant at Dayton. A. E. Kerr is interested.

Nixon, Tex.—C. D. Puckett is making preliminary arrangements for the installation of an electric-light plant in Nixon.

San Antonio, Tex.—The electric-light plant of the Taft Gin & Oil Co. which was recently destroyed by fire will be rebuilt.

Lawton, Okla.—Plans are being considered by the Comanche Light & Power Co. for the reconstruction of its power plant. John C. Keys is Gen. Mgr.

McLoud, Okla.—The town contemplates the extension of an electric transmission line from Shawnee to McLoud, to furnish electricity for street and commercial lighting. Plans for the improvement are being prepared by the Benham Engineering Co., Oklahoma City, Okla.

Loveland, Colo.—At a recent election the citizens voted to issue bonds for $12,000 the proceeds of which will be used for the construction of a municipal electric-light plant. Noted Dec. 25.

Nogales, Ariz.—The City Council has granted a franchise to Spiro Proto and Monte Mansfield for the construction of an electric-light and power plant.

Ridgefield, Wash.—An electric-light plant will be installed at Ridgefield, by J. H. Cunningham, of Portland, Ore.

Eugene, Ore.—The city will soon receive bids for the installation of an ornamental lighting system on Olive St., between Fifth and Ninth Aves., and on Eighth Ave., between Willamette and Lincoln Sts., at an estimated cost of $6000.

Mapleton, Ore.—The County Court recently granted to Richard H. Clow a franchise for the construction and maintenance of a system of electric-light and power lines on the streets of Mapleton and on some of the adjacent county roads. Mr. Clow owns a large water-power site near Mapleton, and will soon start work on his plant.

Placerville, Calif.—The Western States Gas & Electric Co. will expend $50,000 for enlarging and repairing its system in Placerville.

Redding, Calif.—The California Power & Development Co. will build a power house and transmission line 20 miles in length in the Fall River region to supply power and light in that locality. E. B. Bumsted, of the Hannon Engineering Co., is interested in the enterprise. Charles Kornel is Engr.

✚Tropico, Calif.—The NEWBERY BENDHEIM ELECTRIC CO., Stimson Bldg., Los Angeles, has been awarded the contract at $5188 for installing the ornamental lighting system on Brand Blvd.

Tulare, Calif.—The Tulare County Power Co. will construct a hydro-electric plant on Tule river, near Porterville. The company will also make extensions to its transmission lines. A $1,000,000 bond issue will be made for this purpose.

✚Whittier, Calf.—The Southern California Edison Co. has awarded a contract to the F. O. ENGSTRUM CO., 500 Seaton St., Los Angeles, for the construction of a reinforced concrete substation at Whittier, at $4880.

Meductic, N. B.—Plans are being prepared by the St. John River Hydro-Electric Power Co. for the construction of a hydro-electric system. A power house, dam and 80 miles of transmission lines will be built. Estimated cost, $3,500,000.

London, Ont.—Plans are being prepared by H. J. Glaubitz, Ch. Engr. of the Hydro-Electric Commission, London, for the construction of a new power plant to cost, $45,000.

Calgary, Alta—Plans have been prepared for the construction of a municipal electric-light plant to cost $250,000.

BRIDGES

✚Jay, Maine—The Town Council has awarded the contract to the CRY BROS. CO., Waterville, Maine, for constructing the proposed concrete arch bridge at $16,900. It will be a two-span structure, 285 ft. long and have an 18-ft. roadway. Noted Apr. 30.

✚Dedham, Mass.—(Official)—The Board of Selectmen has awarded the contract to the HANCOCK ENGINEERING CO., 79 Chestnut St., Boston, Mass., for constructing the Mill Lane Bridge and approaches, at $15,957. List of bidders noted June 11. Noted May 21.

Central Falls, R. I.—A bridge will be constructed over Blackstone River to cost $60,000. Central Falls, Cumberland, R. I., and the Rhode Island St. Ry. Co. will each pay one-third of the cost. Silas P. Cumming is City Engr.

Natick, R. I.—The lowest bid received June 10, for constructing the proposed reinforced concrete bridge at Natick, to replace the wooden structure recently destroyed by fire, was submitted by T. J. & J. M. Hynes, Springfield, Mass., at $10,204.

Copenhagen, N. Y.—The citizens have voted in favor of constructing a concrete bridge over the Deer River to cost $10,000.

✚Bridgeton, N. J.—Salem County, June 8, awarded a contract to the BRIDGETON CONSTRUCTION CO., Bridgeton, for constructing a bridge in the county, at $11,000.

Gloucester City, N. J.—The War Department has approved of plans submitted by the Board of Chosen Freeholders for a bridge of the lift-type to the constructed over Newton Creek.

South Amboy, N. J.—The City Council has approved plans for a new bridge on Washington Ave., to be constructed over the Raritan River. The structure will be about 33 ft. wide, of reinforced concrete. It will be built by the Raritan River R.R. Noted Apr. 2.

Gate City, Va.—Bids will be received at the Clerk's office, Gate City, until noon, June 29, for the construction of a steel bridge, 233 ft. long, over the north fork of Holston River in Scott County. G. P. Coleman, Richmond, Va., is State Highway Comr.

Parkersburg, W. Va.—The citizens of Parkersburg District, June 11, voted in favor of issuing $175,000 in bonds for the construction of a bridge across the Ohio River at Parkersburg. B. F. Stewart, Jr., is City Engr.

Plaquemine, La.—The Police Jury, Plaquemine, plans to construct a bridge across Bayou Grosse Tete at Indian Village Point. Noted Mar. 19.

Akron, Ohio—Bids will be received until 11 a.m., July 10, by the County Commissioners of Summit County, Akron, for constructing the substructure and superstructure of the Pleasant Valley Bridge. C. L. Bower is Clk.

Cleveland, Ohio—Bids will be received until 10 a.m., July 10, by E. G. Krause, Clk. Bd. County Commissioners, Cleveland, for constructing the Brooklyn-Brighton Bridge. Estimated cost, $600,000.

✚Columbus, Ohio—Bids were opened June 16 by the Ohio Highway Commission for the construction of a bridge across Black River in Lorain County as follows: Superstructure Standard Engineering Co., Toledo, Ohio, $7847; Central Concrete Construction Co., Canton, Ohio, $8433; Modern Construction Co., Fremont, $8247; MASSILLON BRIDGE STRUCTURAL CO., Massillon, Ohio, $6850 (awarded contract); George J. Bock & Son, Coshocton, Ohio, $7995; Capital Construction Co., Columbus, $7995; substructure: G. E. Scott, Norwalk, Ohio, $15,495; Elyria Concrete Construction Co., Elyria, $14,995; COLBUNN BROS., $13,800 (awarded contract); Morris, McGarain & Bassett, Cleveland, Ohio, $14,600.

Hamilton, Ohio—The Commissioners of Hamilton County, Hamilton, have authorized the issuance of $800,000 of flood emergency bonds in addition to the $336,000 already issued. The proceeds of the new issue will be used for the repair and reconstruction of the bridges destroyed during the flood of 1913. Fred M. Hammerle is County Engr.

New Philadelphia, Ohio—Bids will be received by the County Commissioners, New Philadelphia, until July 13, for constructing a reinforced-concrete bridge over Sugar Creek, Franklin Township. It will be 100 ft. long and 16 ft. wide.

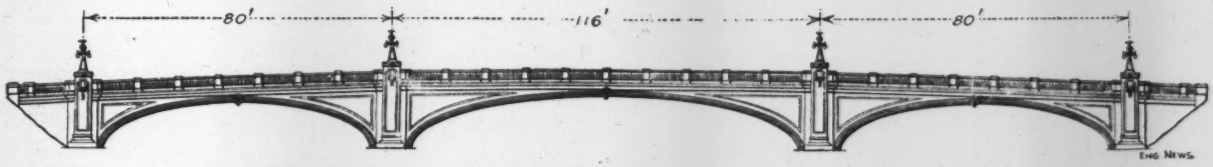
✚Tiffin, Ohio—The contract for the superstructure and substructure of Scott Bridge, No. 91, Seneca Township, has been awarded by the county to the MODERN CONSTRUCTION CO., Tremont, Ohio, at $8140. Bids were opened June 20.

✚Wapakoneta, Ohio—The County Commissioners of Auglaize County have awarded the contract to L. S. FOX, Dayton, Ohio, for constructing the bridge over the canal at Fourth St., Minster, Ohio, at $12,728. Bids were opened June 6. The contract for the St. Marys River Bridge, bids opened same date, was noted June 18.

Youngstown, Ohio—(Official)—Robert A. Boothe, Asst. City Engr., is preparing plans for a reinforced concrete bridge at Fifth Ave. It will be 325 ft. long and 70 ft. wide of ribbed arch construction. The work calls for 3000 cu.yd. of concrete. The city has appropriated $50,000 for the structure. Bids will be received about July 15.

Boonville, Ind.—Bids will be received until 2 p.m., July 7, by the Warrick County Commissioners, Boonville, for constructing 15 bridges. N. M. Spradley is County Audr.

✚South Bend, Ind.—(Official)—Bids were received June 15 by the Commissioners of St. Joseph County, South Bend, for constructing a reinforced concrete bridge over the St. Joseph River at North Michigan St. The contract was awarded to CLEARY & KUERT CO., Indianapolis, Ind., at $93,663. The proposed structure is shown in the accompanying illustration. It has two 80-ft. arches and one of 116 ft. It was designed by Charles W. Cole, City Engr. Noted May 21.



REINFORCED-CONCRETE BRIDGE, NORTH MICHIGAN ST., SOUTH BEND, IND.

Trenton, N. J.—The Board of Chosen Freeholders has approved plans prepared by Theodore Tobish, County Engr., Trenton, for a new bridge on the Lawrenceville Road, over Shabaconk Creek.

Wenonah, N. J.—The county is having plans prepared for a bridge to cost $10,000.

✚Bethlehem, Penn.—The Minsi Trail Bridge Co. has awarded the contract to the McCLINTIC-MARSHALL CONSTRUCTION CO., Pittsburgh and Pottstown, Penn., for constructing the proposed bridge across the Lehigh River in the eastern part of the city at $102,000. The contract for the piers was awarded to the DENBERGER CONSTRUCTION CO., Bethlehem, at $85,000.

Nanticoke, Penn.—Bids will be received until noon June 26, by F. R. Hendershot, County Controller, Wilkes-Barre, Penn., for constructing a bridge between Nanticoke and West Nanticoke, Luzerne County, over the north branch of the Susquehana River. D. A. Keefe, Athens, Penn., is Engr.

Wilkes-Barre, Penn.—Plans for the proposed bridge to connect North Wilkes-Barre and the East End, Wilkes-Barre, have been submitted to the City Council. A. M. Cauley is City Engr.

Crown Point, Ind.—Bids will be received until 10 a.m., July 9, by the Commissioners of Lake County, Crown Point, for constructing three bridges.

Indianapolis, Ind.—(Official)—Bids will be received until July 10 by the County Commissioners, Indianapolis, for constructing the proposed bridge over the White River at West Washington St., Indianapolis. Bids for this work received May 27 were rejected. W. T. Patton is County Audr.

Monticello, Ind.—Bids will be received until 11 a.m., July 7, by the Commissioners of White County, Monticello, for constructing 10 bridges in various parts of the county. A. G. Fisher is County Audr.

Noblesville, Ind.—Bids will be received until 2 p.m., July 7, by W. O. Horton, County Audr., Noblesville, for the construction, repair and improvement of certain bridges in various parts of the county.

Petersburg, Ind.—Bids will be received until 2 p.m., July 7, by the Pike County Commissioners, Petersburg for constructing four steel bridges in Logan Township. John D. Gray is County Audr.

Richmond, Ind.—Bids will be received until June 27 by the Commissioners of Wayne County, Richmond, for bridge repairs to cost about $12,500. Louis Bowman is County Audr.

Bunker Hill, Ill.—(Official)—Bids will be received until 1 p.m., June 29, by the State Highway Commission, at the Town Hall, Bunker Hill, for constructing three reinforced concrete bridges in Bunker Hill Township, Macoupin County. O. B. Conlee Carlinville, Ill., is County Supt. of Highways.

Cairo, Ill.—The Illinois Central R.R. Co. will reconstruct its bridge over the Ohio River at Cairo, using the present piers and replacing the superstructure.

Hillsdale, Ill.—W. Treichler, Engr., Rock Island, Ill., is preparing plans for four reinforced concrete bridges in Canoe Creek Township, each to be 100 ft. long and have a 24-ft. roadway.

Iowa City, Iowa—The citizens of Johnson County have voted in favor of constructing a bridge over the Iowa River at the foot of Burlington St., Iowa City. Estimated cost, $50,000.

✝Waterloo, Iowa—The County Commissioners, June 10, awarded the contract to the DES MOINES BRIDGE & IRON CO., Des Moines, for constructing 17 bridges in various parts of the county at $10,399.

✝Hibbing, Minn.—The contract has been awarded to GUS LINDER, Hibbing, for constructing five concrete bridges on the Day Lake, Connors, Du Pont, Townline and Newton Roads, at $6055.

✝Northfield, Minn.—(Official)—Bids were received June 13 by the City Council for the construction of a bridge over the Cannon River to replace the so called Middle Bridge. The contract has been awarded to the ILLINOIS BRIDGE CO., St. Paul, Minn., at $17,990. Noted June 4.

Lindsborg, Kan.—Bids will be received until July 8, by J. W. Quinn, County Clk., McPherson, Kan., for constructing a bridge over Smoky Hill River at Lindsborg. Estimated cost, $16,000.

✝Manhattan, Kan.—The Commissioners of Riley and Pottawatomie Counties have awarded the contract to the WESTERN BRIDGE CO., for reconstructing the Maridahl Bridge across the Blue River, at $6589.

Paola, Kan.—Bids will be received until noon, July 7, by the Commissioners of Miami County, Paola, for constructing nine bridges in various parts of the county. Carson Lane is Clk.

Topeka, Kan.—The State Engineer, Topeka, has prepared plans for 15 concrete bridges to be constructed in Cloud and Jewell Counties. Estimated cost, $30,000.

Jackson, Wyo.—See item under Federal Government.

✝Choteau, Mont.—(Official)—Bids were received, June 5, by the Board of County Commissioners, Choteau, for constructing the proposed bridge over the Clark Fork River at Fromberg. The contract has been awarded to the MINNEAPOLIS BRIDGE CO., Minneapolis, Minn., at $8050. Noted May 28.

✝✝Divide, Mont.—The County Commissioners, Dillon, Mont., have awarded the contract to the O. E. PEPPARD BRIDGE CO., Missoula, Mont., for constructing the proposed bridge over the Big Hole River near Divide, at $8998. Noted May 7 and June 11 under Dillon.

Athol, Mo.—Bids will be received until 11 a.m., July 9, by the Jackson County Court, Kansas City, Mo., for constructing two reinforced-concrete approaches 269 ft. long over the street railway tracks at Athol. There will be 110 cu.yd. concrete in footings; 40 cu.yd. concrete in columns and caps; 230 cu.yd. concrete in girders and brackets; 200 cu.yd. concrete in floor slab and curb; 170 cu.yd. concrete in abutments and wings, and 538 lin.ft. concrete in hand railing. Rowland T. Proctor is County Surv.

Bloomfield, Mo.—Bids will be received until 2 p.m., July 6, by Sydney Wilson, County Highway Engineer, Bloomfield, for the construction of a steel bridge across Castor River.

Kansas City, Mo.—Bids will be received until 11 a.m., July 9, by the Jackson County Court, Kansas City, for constructing new culverts and lengthening old ones on the Lake City Rd. The work calls for 39,930 cu.yd. of earth excavation; 100 cu.yd. solid rock excavation; 463 cu.yd. plain concrete; 52 cu.yd. reinforced concrete; 240 lin.ft. 18-in. pipe, and 680 lin.ft. 24-in. pipe. Rowland T. Proctor is County Surv.

Kansas City, Mo.—The bill authorizing the Missouri Bridge & Iron Co., Leavenworth, Kan., to construct a bridge to cost $1,250,000 over the Missouri River near Kansas City has been passed by Congress. Noted Sept. 26, 1912.

Kansas City, Mo.—The Walnut St. Viaduct Association has subscribed $60,000 toward the construction of the proposed viaduct across the Belt Line R.R. at Walnut St. Estimated cost, $225,000. Curtis Hill is City Engr.

✝Waynesville, Mo.—(Official)—The County Court of Pulaski County has awarded the contract to the CANTON BRIDGE CO., Kansas City, Mo., for constructing a two-span steel highway bridge 238 ft. long, having concrete piers, at $6875. Bids were opened June 12. Noted May 28.

✝Matador, Tex.—The Commissioners' Court of Motley County, Matador, has awarded the contract for constructing a steel bridge across the Middle Pease River, to AUSTIN BROS., Dallas, Tex., at $12,000.

Rockport, Tex.—(Official)—Bids are being received for the construction of a causeway. The work calls for 12,000 ft. of causeway, one steel lift bridge and two pile trestles. Particulars may be obtained from Percival & Son, County Engrs., Rockport.

✝San Antonio, Tex.—The City Council, June 8, awarded the contract for the construction of the proposed bridge over the San Antonio River to CHARLES M. SCHOENFELD, San Antonio, at $19,950.

✝Denver, Colo.—The city has awarded contracts for the construction of the Colfax-Larimer Ave. Viaduct as follows: For foundations, to SEERIE & VARNUM, Denver; superstructure, to LAMBIE & ALLEN and the DENVER & PUEBLO CONSTRUCTION CO., both of Denver. Contract for the structural iron work will be awarded in July. Noted Dec. 13, 1913.

✝Greer, Idaho—The Commissioners of Clearwater and Lewis Counties have awarded the contract to the SECURITY BRIDGE CO., Lewiston, Idaho, for the construction of the proposed wagon bridge across the Clearwater River at Greer at $16,600. Bids were opened June 6. Noted May 21.

Tucson, Ariz.—J. M. Ruthrauff, City Engr., is preparing plans for a bridge to be constructed over the Santa Cruz River. Estimated cost, $10,000. Noted May 7.

Yuma, Ariz.—See item under Federal Government Work.

Monroe, Wash.—The lowest bid submitted to the county for constructing a bridge at Monroe was that of George H. Griffin, Alaska Bldg., Seattle, Wash., at $32,109.

✝Seattle, Wash.—The city has awarded the contract to the WEYMOUTH CONSTRUCTION CO., Seattle, for constructing the Bell St. Viaduct, at $9484. Noted June 18.

✝Wenatchee, Wash.—The county has awarded the contract to BAILEY & O'CONNOR, Wenatchee, for constructing Dryden Bridge and approaches, including one mile of permanent highway, at $24,965. Noted Feb. 14, 1914.

Houlton, Ore.—Bids will be received until July 6 by H. L. Bowlby, State Highway Engr., Portland, Ore., for constructing two steel bridges netr Houlton.

Portland, Ore.—(Official)—Bids will be received until July 1 by the County Court of Clackamas County, Portland, for constructing two 210-ft. pin-connected spans to be built by Nov. 15, 1914.

✝Madera, Calif.—(Official)—The Commissioners of Madera County have awarded the contract to J. WILLISON, for constructing the Chonchilla Bridge, at $6142. The structure will be of steel.

✝Placerville, Calif.—The County Supervisors have awarded the contract to JENKINS & WELLS, for constructing the proposed bridge over Webber Creek on the state highway, at $5367.

✝Red Bluff, Calif.—The Board of Supervisors of Tehama County has awarded the contract for replacing two piers of the Oak St. Bridge to the ROSS CONSTRUCTION CO. at $24,840.

Sacramento, Calif.—The State Highway Commission has rejected all bids for the construction of the proposed bridge over the Yolo Basin known as the Yolo Basin Viaduct as excessive. Engineer's estimate, $363,800. Noted Apr. 30.

✝San Diego, Calif.—The San Diego Electric Ry. Co. has awarded the contract to CHARLES W. CORBALEY, I. W. Hellman Bldg., Los Angeles, Calif., for the construction of three bridges on its new trolley line now being constructed through the Exposition Grounds, at $65,000.

San Luis Obispo, Calif.—Plans prepared by the Federal Engineering Co., Central Bldg., Los Angeles, Calif., have been adopted by the Supervisors for the Nipomo St. bridge. Bids for its construction will be asked soon.

✝Soledad, Calif.—The Board of Supervisors of Monterey County has awarded the contract for the construction of a steel and concrete bridge across the Salinas River to the W. N. CONCANNON CO., Monadnock Bldg., San Francisco, Calif., at $60,508.

Yuba City, Calif.—Bids will be received by the Board of Supervisors of Sutter County until June 29 for the construction of a reinforced concrete bridge across Butte Slough at Yuba City. Estimated cost, $60,000. E. L. Cope, Yuba City, is Engr.

Notre Dame de Lourdes, Que.—Bids will be received until June 30 by Eugene Bedard, Mayor, for the construction of a reinforced concrete bridge to cost $12,000.

Hawkesbury, Ont.—Bids will be received until July 14 by R. C. Desrochers, Secy. Dept. Pub. Wks., Ottawa, Ont., for constructing the substructure and approaches for the interprovincial highway bridge at Hawkesbury.

Weyburn, Sask.—The city is having plans prepared for a steel bridge to be constructed at Third St. Estimated cost, $15,000. George Ross is Clk.

Nanaimo, B. C.—The City Engineer has been directed to prepare plans for the proposed bridge to be constructed over Mill Stream. Estimated cost, $16,000.

✝North Vancouver, B. C.—District of North Vancouver has awarded the contract to NAYLOR BROS., Victoria, B. C., for constructing a bridge over MvCartney, Creek Ravine, about four miles east of North Vancouver, at $17,800. The structure will be of reinforced concrete.

✝Vancouver, B. C.—The British Columbia Electric Ry. Co. has awarded the contract to J. COUGHLAN & SONS, Vancouver, for a steel span for Kitsilano Bridge. It will be 125 ft. long and weigh about 100 tons.

Victoria, B. C.—F. L. Fellos, City Engrs., has completed plans for the proposed bridge over Rocky Bay. Estimated cost, $50,000.

WATER SUPPLY—IRRIGATION

Lewiston, Maine—(Official)—Bids will be received until June 25 by C. J. Callahan, Clk. of the Water Board, for installing new pumps at the water works. The estimated cost is $20,000. Noted June 18.

Hampton, N. H.—The Hampton Water Works Co. has retained Charles N. Taylor, Wellesley to prepare plans for a water system. About 12 miles of 6- 8- and 10-in. pipe an 85-ft. standpipe 25 ft. in diameter with the necessary machinery will be required. William H. Jaques, Little Boars Head, is Pres.

✝Beverly, Mass.—The contract for furnishing pipe and specials for the year 1914 has been awarded to R. D. WOOD & CO., Philadelphia, Penn., at $21 per ton.

Fitchburg, Mass.—The city has been authorized to issue $300,000 in bonds for the improvement of the water supply. Noted Dec. 4 and Jan. 8.

Framingham, Mass.—Bids will be received by the Water and Sewer Commissioners until June 29 for laying about 9700 ft. of 12- and 18-in. c.-i. water pipe. J. J. Van Valkenburgh, South Framingham, is Engr.

Sterling, Mass.—A special committee on water supply has recomended the installation of a water system costing $27,000 John H. Coughlin is Chn. of the Comm. Noted Dec. 18, 1913.

✚Torrington, Conn.—The contract for constructing a concrete dam for the Torrington Water Co. has been awarded to FRANK W. FULLER. Noted Oct. 2, 1913.

Albion, N. Y.—Bids are being received by W. B. Dye, Pres. Bd. of Trustees for construct.ng a new pumping station and mated cost is $65,000. J. F. Witmer Co., Buffalo, is the Engr. making improvements to the water system. The esti- Noted June 4.

Binghamton, N. Y.—Nicholas Hill, Jr., Consult. Engr., New York, N. Y., will soon submit a report on a new distribution system. Noted Oct. 23, 1913.

East Syracuse, N. Y.—The State Conservation Commission has granted an application to East Syracuse for the extension of the water system. The estimated cost is $20,000. Noted May 7.

★Hudson, N. Y.—(Official)—Bids will be received by Henry M. James, Secy. Comn. of Pub. Wks., until 7:30 p.m., July 22 for water proofing the old wall and constructing a six-inch reinforced concrete cut-off wall on the upstream face of the storage reservoir dam at Churchtown. M. J. O'Hara is City Engr.

Lyons, N. Y.—Bids will soon be received for the construction of a pumping plant for the water works. The estimated cost is $140,000. The J. F. Witmer Co., Dunn Bldg., Buffalo, is the Engr.

New York, N. Y.—(Official)—Bids will be received by the Board of Water Supply, until 11 a.m., July 14 for roofing with reinforced concrete tiles 46 superstructures along the line of the Catskill Aqueduct. Charles strauss is Pres. of the Bd.

★(Official)—Bids were received June 23, by the Board of Water Supply for constructing the Ashokan bridge, Town of Olive. The Transit Construction Co., Mt. Vernon, N. Y., was low bidder at $114,000. Noted June 4.

✚(Official)—The contract for constructing superstructures at the Ashokan Reservoir, Town of Olive has been awarded to MICHAEL STAUB, Mamaroneck, N. Y., at $344,000. Bids were opened June 2. Noted May 7 and June 4.

✚St. Johnsville, N. Y.—(Official)—Bids were received June 15 by the Water Commissioners for the construction of a concrete reservoir as follows: R. F. RELLY CO., Saranac Lake, N. Y., at $11,880 (awarded contract); Nixdorf & De Senza, $17,258; Suburban Engineering Co., $14,835; John E. Pidgeon, $16,385; W. A. Lafler, $17,349; W. L. Bellinger, $15,400; and Oliver Hurst, $14,920. F. E. Crane, Amsterdam, is Engr. Noted June 4.

Lakewood, N. J.—(Official)—Chapman & Graham, Engrs., Jamestown, N. Y., have been retained to prepare plans for extensions to the water system.

✚★Milltown, N. J.—(Official)—Bids were received by the Borough Council, June 15, for constructing a water system as follows: SUBURBAN ENGINEERING CO., New York, N. Y., $34,623 (awarded contract); Sutton & Corson Co., Ocean City, $35,809; Pitt Construction Co., Pittsburgh, $38,804; Schneider & Stelle, New Brunswick, $40,466; Fillebrown-Taylor & Co., New York, N. Y., $40,603; F. M. Lewis, New York, N. N. Y., $41,120; John W. Hellar, Newark, $41,459; Kelley-McFeeley Co., Camden, $41,644; Moran & Sebolt, New Brunswick, $42,953; Atlantic Construction & Supply Co., Atlantic City, $43,243; John J. Hart, Peekskill, N. Y., $46,931; Connecticut Engineering & Construction Co., Norwich, Conn., $48,848; and John E. Donovan, Port Richmond, N. Y., $49,417. Clyde Potts, 30 Church St., New York, N. Y., is Engr. Noted May 28.

★Reading, Penn.—(Official)—Bids will be received by Charles Marks, City Clk., until 10 a.m., July 1 for repairing and reconstructing the Antietam Dam. For details see "Contracts To Be Let."

✚Emporia, Va.—The contract for constructing a steel water tank and tower has been awarded by the Water Commissioners to the PITTSBURGH-DES MOINES STEEL CO. Noted May 21.

Richmond, Va.—A chlorination plant will be installed at the settling basins. The estimated cost is $5000.

Huntington, W. Va.—A water system will be constructed in Ritter Park by the city. Floyd S. Chapman is Mayor.

Wheeling, W. Va.—An election will be held July 9 to decide what kind of a filtration plant will be installed. A. Johnson & Fuller, 150 Nassau St., New York, N. Y. are the Engrs. Noted Dec. 11, 1913.

Scotland Neck, N. C.—J. B. McCrary Co., Atlanta, Ga., will prepare plans for the construction of a water system.

Wadesboro, N. C.—According to press reports the city will install a filter and construct a reservoir. The estimated cost is $10,000. J. F. Allen is Chn. Water Comrs.

Crystal Springs, Fla.—Plans have been approved for the construction of a water system costing $40,000.

Florala, Fla.—Bonds for $16,000 for extending the water and sewer systems were voted at an election held June 15.

St. Augustine, Fla.—The installation of a water-softening plant is being considered.

Brandon, Miss.—S. L. McLaurin contemplates constructing a water system. Plans have not yet been prepared.

Flora, Miss.—Bids will be received by C. L. Holloway, Supt. Water and Light, until July 1 for furnishing a 30,000-gal. steel tank, a 90-ft. tower and 12,000 ft. of pipe. Noted Jan. 22.

Knoxville, Tenn.—Robert Elliott, Waterworks Comr., has retained Rudolph Hering, Consult. Engr., New York, N. Y., to pass upon the condition of the interior of the west basin and make a report.

★Memphis, Tenn.—(Official)—Bids will be received by C. C. Pashby, City Clk., until noon, July 14 for constructing a pumping station. For details see item under "Contracts To Be Let."

Nashville, Tenn.—The Board of City Commissioners has appropriated $45,000 for water-proofing the west basin of the city reservoir. W. W. Southgate is City Engr.

✚Nashville, Tenn.—The contract for repairing the water system has been awarded by the City Commissioners to C. B. WILSON & CO., at about $20,000. Noted Apr. 23.

Brewster, Ohio—(Official)—The W. J. Sherman Co., Consult. Engr., Toledo, has been retained by the village to prepare plans and supervise the construction of a new municipal water system. Noted June 4.

★Frankfort, Ohio—(Official)—Bids will be received by George H. Schadel, Clk. Bd. of Trustees of Pub. Affairs, until noon, July 21 for constructing a water system. Plans are on file with the W. J. Sherman Co., Nasby Bldg., Toledo, Ohio.

✚Glendale, Ohio—Bids were opened June 8 for extending the height of the water works standpipe. The contract has been awarded to CHARLES F. RENICK, Jr., 3978 Clifton Ave., Cincinnati, at $5000. Noted May 14.

Milford, Mich.—The water system will be improved by an expenditure of $9000, bonds for which have been voted.

Rochester, Mich.—Bids will be received until 7:30 p.m., June 29 for laying 4- and 6-in. c.-i. water pipe with the necessary valves, hydrants, etc. John E. Jackson is Supt. of the Water Wks.

Kewanee, Ill.—Plans have been prepared for the laying of water mains in several streets.

★La Rose, Ill.—(Official)—The village will install a water system. For particulars see advertisement under "Contracts To Be Let." W. E. Berg is Chn. of the Water Comn.

Quincy, Ill.—The Citizens Water Co. contemplates constructing a new pumping station on Towhead Island. W. H. Govert is interested.

Rockford, Ill.—Bids will be received by the Superintendent of the Water Department until 10 a.m., June 27, for drilling a well in Hulin Park.

Bloomington, Wis.—The citizens contemplate purchasing the water system for $10,000 and enlarging it.

✚Two Rivers, Wis.—The contract for sinking a well 1800 ft. for the city water supply has been awarded to W. H. GRAY & BROS., Chicago, Ill.

Wauwatosa, Wis.—The town contemplates extending the water system at an estimated cost of $62,000.

Esterville, Iowa—Bonds for $60,000 have been voted by the citizens for the extension of water mains and electric-light system. Noted Apr. 23.

Winfield, Iowa—(Official)—Bids will be received until July 7 for constructing a water system. The estimated cost is $15,000. J. O. Kilbourn is Chn. of the Water Wks. Comn. Noted Nov. 6, 1913.

✚Hibbing, Minn.—The contract for installing a water system has been awarded by the Village Council to LAYNE & BOWLER CO. at $398,855. Noted June 11.

✚Litchfield, Minn.—(Official)—Bids were received May 25 by the Village Council for constructing a steel water tank as follows: MINNEAPOLIS STEEL & MACHINERY CO., Minneapolis, at $5389 (awarded contract); St. Paul Foundry Co., $5999; J. G. Robertson, $5645; National Co., Northwest, $5460; Des Moines Bridge & Iron Co., $5690; Chicago Bridge Iron Works, $5754. Noted May 21.

Riverton, Minn.—The village contemplates spending $30,000 for the construction of a water and a sewer system.

Logan, Kan.—The citizens contemplate extending the water system at an estimated cost of $10,500.

Protection, Kan.—Worley & Black, Engrs., Kansas City, Co., are preparing plans for the construction of a water system at Protection to cost $30,000.

Solomon, Kan.—It is reported that Solomon contemplates installing a water system.

✚Washington, Kan.—Contracts for constructing a water system have been awarded to: E. W. MIDDLETON, Kansas City, Mo., at $10,105 for installing a 50,000 gal. purification plant and to the NEW YORK CONTINENTAL JEWELL FILTRATION CO., New York, N. Y., at $6700 for installing equipment. Worley & Black, Kansas City, Mo., are the Engrs. Noted May 21.

Herman, Neb.—(Official)—Bids will be received by the Village Board of Trustees until noon, July 6 for constructing a water system. The work will include a stand pipe 100 ft. high and 10 ft. in diameter. William Schafersman is Chn. Bd. of Trustees.

Humboldt, S. D.—Bids will be received by the Town Clerk, until July 10 for constructing a water system. Stanley Edmonds, Yankton is Engr. The estimated cost is $10,000.

Clydepark, Mont.—Plans are being prepared by the C. H. Green Co., Spokane, Wash., for the construction of a municipal water system.

Charleston, Mo.—(Official)—Bids will be received by O. W. Joslyn, Mayor, until 7 p.m., July 2, for constructing a water system. Frank L. Wilcox, Syndicate Trust Bldg., St. Louis, is Engr.

Springfield, Mo.—The Springfield Water Works Co. will sink two new wells and make other improvements.

Abilene, Tex.—The Brazoc River Irrigation Co. will construct a dam across the Clear Fork of the Brazos River, 14 miles north of Abilene. The water will be used to irrigate a large tract of land .

Blessing, Tex.—The Farmers Canal Co. contemplates constructing an irrigation system to water 15,000 acres. The supply will be received from the Tress Palacios River.

El Paso, Tex.—According to press reports A. N. Loomis and associates will construct an irrigation system in the valley of the Rio Grande to irrigate 11,545 acres.

Groesbeck, Tex.—At a recent election the citizens voted $10,000 in bonds for the improvement of the water system.

Milford, Tex.—The city will construct a water system at an estimated cost of $14,000. Henry E. Elrod, Dallas, is Consult. Engr. Noted May 28.

San Antonio, Tex.—According to press reports the San Antonio Water Supply Co. contemplates constructing a water pumping station near Brackenridge Park. R. J. Harding is Ch. Engr.

Hartshorn, Okla.—The extension of the water system is being considered by the Water Works Commissioner of the City Council.

New Wilson, Okla.—S. P. Brimer contemplates organizing a company to construct a water system.

Mead, Colo.—Bids will be received by the Town Clerk, until June 26 for constructing a water system. G. H. Sethman, Denver, is Engr.

Dexter, N. M.—Bids will be received until July 1 for the sale of $12,000 in bonds for constructing a water system.

Salt Lake City, Utah—The state of Utah will rebuild the Hatchtown dam recently destroyed by flood. The estimated cost is $100,000. W. D. Beers, Salt Lake City is State Engr.

✚Salt Lake City, Utah—(Official)—The contract for constructing the 13th St. South supply line has been awarded by the city to LYMAN & SAMUELS, Salt Lake City, at $92,396. Other bidders were: James Kennedy, $96,006; P. J. Moran Contracting Co., Inc., $96,080; Enoch Smith, $102,643; Gillis-Brittain Co., $104,579; A. C. Bird & Co., $106,626; Campbell Building Co., $110,271; Continental Contracting Co., $116,626. S. A. Cannon is City Engr. Noted May 21.

✚Flagstaff, Ariz.—The contract for constructing a 50,000,000-gal. reservoir for the Atchison, Topeka & Santa Fé R.R. at Smith's Springs ranch has been awarded to the SHARP & FELLOWS CONSTRUCTION CO., Central Bldg., Los Angeles, at about $100,000. Noted Dec. 11, 1913.

Seligman, Ariz.—The Atchison, Topeka & Santa Fé R.R. contemplates constructing a storage dam and reservoir near Seligman. A 20-mile pipe line will also be constructed to carry the water to a point available for its use.

Tucson, Ariz.—The Pima Realty Co. will extend a 10-in. main from the city water mains on West Congress St. to Mento Park.

✚Seattle, Wash.—(Official)—The contract for laying water mains has been awarded by the city to L. R. ELLIS, Central Bldg., Seattle, at $12,410. Noted June 11.

Snohomish, Wash.—Improvements costing $19,000 are to be made to the municipal water system.

✚Lafayette, Ore.—The contract for installing a water system has been awarded to the MORGAN-BOYATT CO., Portland, at $15,000. Noted May 28.

Anderson, Calif.—Plans are being prepared for the construction of an irrigation system for the C. C. Moore ranch, to cost $20,000. A. J. Shields is Mgr.

Long Beach, Calif.—Bids will soon be received by the Board of Public Works for furnishing 2000 tons of c.-i. pipe and 20 tons of screw pipe for the water department.

Panama—See item under "Federal Government."

✚Toronto, Ont.—(Official)—The contract for constructing a slow sand filtration plant on Toronto Island has been awarded to JOHN verMEHR ENGINEERING CO., LTD., Toronto and to WILLIAM COWLIN & SON, LTD., Toronto, at $1,066,282. Noted Feb. 19.

Battleford, Sask.—The council will have plans prepared for a water system. Estimated cost, $60,000.

Athabasca, Alta.—The town will construct a reinforced concrete reservoir with a capacity of 100,000 gal. C. L. Huff is Engr.

✚Calgary, Alta.—The contract for furnishing the 6-, 8-, 10- and 12-in. c.-i. pipe for the water department has been awarded to the CANADA IRON CORPORATION, Montreal. Noted May 21.

SEWERS

Boston, Mass.—Bids will be received by the Public Works Department until June 26 for laying sewer pipe in Anawan and Clement Aves., Kenneth and Beach Sts., West Roxbury District.

Bids will be received by the Public Works Department, until June 29 for constructing sewerage works at Tremont Entrance, Roxbury District.

Bids will be received by the Public Works Department until June 30 for laying sewer pipe in Lesher, South and Washington Sts., West Roxbury District. L. E. Rourke is Comr.

Worcester, Mass.—The Committee on Sewers of the City Council has recommended the laying of sewers in the following streets: Apricot, Beach, Leeds, Burncoat Sts., Hadwen Lane, Summerville Ave. and Forestdale Road. The estimated cost is $8000.

✚Bridgeport, Conn.—The Paving and Sewer Commission has awarded contracts to the PIERCE MFG. CO., Bridgeport, for constructing a sewer in Brooks St., at $27,450; and sewers in Orland and Freeman Sts. and Bishop Ave., at $5901. B. D. Pierce, Jr., Bridgeport, submitted low bids for constructing the Johnson Creek sewer and the Knowlton Ave. sewer at $7559 and $49,845 respectively. Noted May 28.

Southington, Conn.—The lowest bid received for the construction of about 13.5 miles of sewers was that of Bernardino & Tomassetti, Meriden, Conn., at $110,000. Noted May 14.

Buffalo, N. Y.—(Official)—Bids were received, June 17, the Board of Public Works for constructing a 9½-ft. b trunk sewer in Hertel Ave. and Tonawanda St. as follo Joseph F. Stabell Co., $93,983; Hager & George, Inc., $98, William C. Culliton, $105,745; Dark & Co., $114,700; Fron Construction Co., $120,000; Buffalo Dredging Co., $129, Noted June 11.

Huntington, N. Y.—The Town Board contemplates creati a new sewer district and constructing sewers therein.

✚New York, N. Y.—(Borough of Brooklyn)—The contr for constructing sanitary and storm sewers in Homecr Ave., East 13th. 14th, 15th. and 17th Sts. from Ave. R to A U and in Ave. T from Coney Island Ave. to East 18th has been awarded to JOHN C. SCHRADE, Inc., 2132 Beve Road, Brooklyn, at $62,526. Bids were opened June 10. Not June 4.

North Tonawanda, N. Y.—Press reports state the A. C. Smith, City Engr. has been authorized to have plans pr pared for the installation of a sewer system and dispos plant. The estimated cost is $500,000.

Syracuse, N. Y.—Plans are being prepared for the construction of storm water sewers in the First, Second and Third Wards. The estimated cost is $90,000.

Camden, N. J.—The city contemplates constructing sewers in 27th, Sheridan Sts. and Ferry Ave. A. L. Sayers is Street Comr.

✚★Milltown, N. J.—(Official)—Bids were received June 15 by the Borough Council for constructing a sewer system as follows: SCHNEIDER & STELLE, New Brunswick, $57,175 (awarded contract); Moran & Sebolt, New Brunswick, $57,336; Frank Puglia, Paterson, $59,989; Connecticut Engineering & Contracting Co., Norwich, Conn., $60,535; John W. Heller, Newark, $61,913; Fillebrown Taylor Co., New York, N. Y., $62,703; Atlantic Construction & Supply Co., Atlantic City, $63,931; Kelley-McFeeley & Co., Camden, $71,048; Sutton & Corson Co., Ocean City, $72,935; John J. Hart, Peekskill, N. Y., $73,128; and Joseph Johnson & Sons, New York, N. Y., $97,717. Clyde Potts, 30 Church St., New York, N. Y., is Engr. Noted May 28.

Newark, N. J.—(Official)—Bids were received by the Passaic Valley Sewerage Commissioners for constructing Section 17 Northern Portion main intercepting sewer as follows: The Whiting-Turner Construction Co., Baltimore, Md., $174,664; Beaver Engineering & Contracting Co., New York, N. Y., $159,300; Merrill-Ruckgaber Co., New York, N. Y., $158,800; Bruno & Petitti, Belleville, N. J., $154,200; New York & New Jersey Construction Co., New York, N. Y., $139,600; and the Harrison & Craig Co., Newark, N. J., $139,200. John S. Gibson is Clk. of the Comn.

Perth Amboy, N. J.—The City Council contemplates constructing sewers in Carson, Amboy and Donald Aves., Jaques, Johnstone and Cornell Sts. Wilbur La Roe is City Clk.

Trenton, N. J.—(Official)—Bids will be received by the City Commission, until 2:30 p.m., June 26, for constructing sewer No. 573 in Mead St. Frank Thompson is City Clk.

✚★Carbondale, Penn.—Bids were received June 2 by the City Clerk for constructing a sewer in Belmont St. The contract has been awarded to MATTHIAS STIPP, Scranton, at $0.79 per ft. Noted May 28.

Tarentum, Penn.—The citizens contemplate installing a sewage disposal plant. Leo Hudson is Consulting Engr.

Kensington, Md.—(Official)—Bids will probably be received about July 23 for the construction of sewer and water systems costing $50,000. Herbert W. Hutton, Wilmington, Del., is Consult. Engr. Noted May 7.

✚★Washington, D. C.—(Official)—Contracts for constructing sewers have been awarded to the WARREN F. BREINZE CO., 141 Q St., N. W., Washington, for constructing a sewer in Wisconsin Ave. and to R. B. WERNER, Willow Grove, Penn., for sewers in Woodbridge and Foxhall Roads. D. C. Oliver is one of the Comrs. Noted May 7.

Florala, Fla.—See item under "Water Supply and Irrigation."

Miami, Fla.—Plans are being prepared by B. H. Klyce, Engr., Nashville, Tenn., for the construction of about 31 miles of sewers in Miami. Bids will be received for the work sometime in September.

★Mobile, Ala.—(Official)—Bids were received June 15 for constructing about 19,000 ft. of sewers as follows: Jett Bros. Contracting Co., Mobile, $13,221; Southern Asphalt & Construction Co., Birmingham, $13,836; Perry & Bonner, Mobile, $13,873; F. G. Proudfoot, Chicago, Ill., $14,869; George A. Muths, Mobile, $14,975; Bayley Reeder & Co., Mobile, $15,662. P. F. Powers & Son, Memphis, Tenn., $15,863; Sullivan, Long & Hagerty, Bessemer, $15,909; Dunn & Lallande Bros., Birmingham, $17,313 and Jamison & Hallowell, Montgomery, $17,533. Wright Smith is City Engr. Noted May 21.

✚Lexington, Ky.—The contract for constructing a storm sewer has been awarded to LOUIS DES COGNETS & CO., Lexington.

Brewster, Ohio—(Official)—The W. J. Sherman Co., Consult. Engr., Toledo, has been retained by the village, to prepare plans and supervise the construction of a complete sanitary sewer system.

Cleveland, Ohio—(Official)—Bids were received June 11 by A. R. Callow, Comr. of Purchases and Supplies, for constructing diversion sewer, junction and overflow chambers, screen and grit chambers and wooden flumes as follows: W. P. Gibbons, $15,742; Pitt Construction Co., $14,285; J. Conley Construction Co., $14,080; Duquesne Construction Co., $12,424; Charles Fath & Co., $15,611; and J. C. Devine, $12,097 (low bidder). Noted June 4.

Findlay, Ohio—(Official)—Bids will be received by the Director of Public Service, until noon, June 27, for constructing a combined sanitary and storm water sewer in Putnam St. Joseph Pago is Clk.

✚Kenmore, Ohio—(Official)—Bids were received June 6 for constructing sanitary sewers. The contract has been awarded to E. McSHAFFREY & SON, Akron, at $136,572. Noted June 4.

✚Marietta, Ohio—The contract for constructing sewers in various streets for which bids were opened May 26, has been awarded to FOREMAN & PUTNAM, at $26,000. Noted May 21.

Marion, Ohio—Bids will be received by M. H. Case, Dir. of Pub. Ser., until July 8 for constructing a sanitary sewer in Uncaphyr, Bennett and Wallace Sts.

Sandusky, Ohio—Bids will be received by the Director of Public Service until July 3 for constructing sewers in the West End Sewer District.

Youngstown, Ohio—(Official)—Bids will be received by the Director of Public Service until noon, June 26 for constructing a sewer in Green St. H. C. Fox is Clk.

Indianapolis, Ind.—Plans have been prepared for the construction of a sewer in College Ave. It will be 8-ft. 6-in. in diameter, 4415 ft. long and will cost about $90,000. B. J. T. Jeup is City Engr.

Bay City, Mich.—According to press reports the City Council has approved plans for the construction of a district sewer in the Ninth Ward. The estimated cost is $9000. Lovell U. Grant is City Clk.

★Rockford, Ill.—See item under "Streets and Roads."

Rockford, Ill.—Bids will be received by the Board of Local Improvements until June 26 for sewer construction.

Racine, Wis.—Plans have been prepared by John H. Alvord, Sanitary Engr., for constructing sewers in the west side. Noted May 7.

Reedsburg, Wis.—Bids will be received until July 6 for constructing lateral sewers in Myrtle and Pine Sts. W. H. Diedken is City Clk.

Wausau, Wis.—Bids are being received by the Board of Public Works for laying sewer pipe in First Ave., Fifth Ave. and Hamilton St. B. C. Gowan is City Engr.

✚Lakefield, Minn.—Bids were received by the Village Clerk, June 9 for constructing 19,328 lin.ft. of 8- to 15-in. sewers, a settling tank, sludge bed and buildings as follows: H. J. CATHROE & CO., Omaha, Neb., $29,700 (awarded contract); Bossworth, Ada, $30,585; Katz Construction Co., Omaha, Neb., $30,600; Redding & Savage, Windom, $32,124.

✚Virginia, Minn.—According to press reports the City Council has awarded a contract to the LAWRENCE McCANN CONSTRUCTION CO., Duluth, Minn., at $66,073 for the improvement and extension of the sewer system.

Riverton, Minn.—See item under "Water Supply and Irrigation."

✚Armour, S. D.—(Official)—Bids were received June 3 by J. C. Perkinson, City Auditor, for constructing a sewer system. The contract has been awarded to ALLERMAN & McLAIN, Yankton, S. D., at $11,426. Noted May 28.

Charleston, Mo.—(Official)—Bids will be received by O. W. Joslyn, Mayor, until 7 p.m., July 2, for constructing a sewer system. Frank L. Wilcox, Syndicate Trust Bldg., St. Louis, is Engr.

St. Louis, Mo.—The Board of Public Improvements has approved plans for the construction of the proposed Mill Creek Valley storm water sewer system to cost about $3,000,000. Bids for the work will be received about Aug. 15.

Dallas, Tex.—According to press reports bids will be received about July 10 for constructing a municipal sewage disposal plant. R. R. Nelms is Sewerage Comr. Noted Dec. 25, 1913.

Galveston, Tex.—According to press reports the city will construct lateral sewers costing $19,000. A. T. Dickey is City Engr.

✚Houston, Tex.—The contract for constructing a sanitary sewer in Hyde Park has been awarded by the City Council to HUNTER & HUNTER, at $7000. Bids were opened June 1. Noted May 28.

Houston Heights, Tex.—(Official)—Bids will be received until 8 p.m., July 27, by H. F. Isbell, Mayor, and the Board of Aldermen for constructing about 30 miles of sewers.

Salt Lake City, Utah—The City Commission contemplates constructing about 60 miles of sewers costing $883,000. S. Q. Cannon is City Engr.

✚Leavenworth, Wash.—The contract for installing a sewer system has been awarded to HERMAN STOLTZ, Leavenworth.

Seattle, Wash.—T. I. Peterson at $17,289 was low bidder for constructing a sewer in Ninth Ave. South.

✚The contract for laying sewer pipe in 14th Ave. N. W. has been awarded to L. COLUCCIO, Seattle at $10,091. Noted June 18.

Portland, Ore.—William Lind was low bidder at $108,599 for the construction of a vitrified pipe sewer in Rhine St. Other bids were: J. Kennedy, vitrified pipe, $126,717; Giebisch & Joplin, vitrified pipe, $127,366; Giebisch & Joplin, concrete pipe, $127,261; Jeffry & Bufton, vitrified pipe, $117,266; Elliott Contracting Co., concrete pipe, $123,129; J. F. Shea, vitrified pipe, $122,791; Peninsula Sand & Gravel Co., vitrified pipe, $126,185.

Portland, Ore.—Bids will be received by A. L. Barbour, City Audr. until July 15 for constructing a sewer in 55th and East Oak Sts.

✚Berkeley, Calif.—The City Council has awarded a contract for the construction of a sewer in Addison and Sacramento Sts. to KARL EHRHART at $54,000; and in Shattuck Ave. to H. E. FRANKS at $29,295.

Long Beach, Calif.—Plans have been prepared by Olmstead & Gillelen, Engrs., Hollingsworth Bldg., Los Angeles, for the construction of a sewer system at Long Beach. Bonds for $340,000 have been voted, but not sold, for this work. Harry B. Riley is City Clk. Noted June 11.

✚Los Angeles, Calif.—The contract for constructing a sewer in Prospect Ave. has been awarded by the Board of Public Works to JOSEPH CHUTUK, 532 South Mathews St., Los Angeles, at $18,118.

✚South Pasadena, Calif.—(Official)—Bids were received by John W. Scott, City Clk., June 13 for constructing a section of the Interior Sewer System as follows: MLAGENOVICH & GILLESPIE, Los Angeles, $44,951 (awarded contract); Watson & Spicer, $45,746; Andrew Halloway, $48,823; R. N. Nikcevich, $50,429; J. C. Mikojevich, $51,445; M. R. Fulmis, $54,215; R. C. Lowell, $56,524. Noted June 11.

Watts, Calif.—(Official)—We have been informed that in connection with the proposed sewer system there will be two outfall sewers discharging into tanks for treating the sewage. R. D. Kyle, City Engr., would like to hear from manufacturers or patentees of processes for sewage treatment. Noted June 18.

Hamilton, Ont.—A. F. McCallum, City Engr., is preparing plans for a new overflow sewer to cost $500,000.

GARBAGE

Albany, N. Y.—(Official)—Hering & Gregory, Consult. Engrs., New York, has been retained by the Board of Contract and Supply, to investigate and report on the best method of collecting and disposing of the garbage, rubbish and ashes of the city. Frank R. Lanagan is City Engr.

★Akron, Ohio—(Official)—Bids will be received until noon, July 14, by the Director of Public Service for constructing the buildings for the garbage reduction works. Ira A. Priest is Clk. For details see advertisement under "Contracts To Be Let."

Lansing, Mich.—The Mayor has recommended the establishment of a municipal garbage collection system and the construction of an incinerator to cost about $5000. H. W. Sparks is City Engr.

Beloit, Wis.—The city is considering the construction of a municipal garbage incinerator. H. E. Burger is Health Officer.

Salina, Kan.—The city is considering the installation of a garbage incinerating plant.

STREETS AND ROADS

Augusta, Maine—Bids will be received until July 1 for $500,000 highway improvement bonds.

✚Augusta, Maine—Contracts for highway construction work have been awarded as follows: A. D. BRIDGE'S SONS, INC., Hazardville, Conn., at $21,961 for the Waldoboro, Section No. 1; AHERN CONSTRUCTION CO., Willimantic, Conn., $22,749 for the Waldoboro Section No. 2; A. D. WILLIAMS & CO., Boston, Mass., $10,547, $13,295 and $10,506, for the Trenton Sections Nos. 1, 2 and 3, respectively; G. MILLER CO., Hartford, Conn., $28,684, for the Monmouth Section.

Portsmouth, N. H.—The City Council has voted to pave Deer, Bridge and Islington Sts.

Boston, Mass.—Bids will be received by the State Highway Commissioner until June 30 for surfacing 5200 lin.ft. of road in Great Barrington. Arthur W. Dean, 15 Ashburton Pl., is Chief Engr.

✚Chelsea, Mass.—The contract for constructing artificial stone sidewalks during 1914 has been awarded to A. S. HUDDELL at about $15,000.

Newton, Mass.—Bids will be received by Park Committee until July 1 for grading Auburndale Park near West Pine St. William C. Brewer is Chn. of Com.

★✚Greenwich, Conn.—The following contracts have been awarded to the BARKER & BONNER CO., New York, N. Y., for permanent pavements on Brookside Drive, $7263, King St. $6911 and Round Hill Road, $20,887. Noted May 21.

✚Hartford, Conn.—Bids will be received by the State Highway Commissioner until 2 p.m., Tuesday, June 30, for the follcwing road work:

Putnam Township, about 6307 lin.ft. native stone or trap rock bituminous macadam construction on the Woodstock Road. Plans are on file with the Town Clerk, Putnam.

Hartford City, about 8000 lin.ft. of warrenite, annesite, topeka or concrete (reinforced or plain) construction on Albany Ave. Plans are on file with Leon F. Peck, Supt. of Streets.

Manchester Township, about 3425 lin.ft. plain or reinforced-concrete construction on the Twin Hill Roads. Plans are on file with Robert W. Stevens, Div. Engr., Connecticut Mutual Bldg., Hartford.

Salisbury Township, about 4040 lin.ft. of graded construction with 6-in. hardening surface on Smith Hill. Plans are on file with Robert S. Hulbert, Winsted.

Watertown Township, about 6450 lin.ft. trap rock or native stone macadam or gravel construction on the Thomaston Road. Plans are on file at the Town Hall, Watertown.

Brooklyn Township, about 4000 lin.ft. native stone macadam construction on the Wauregan Road. Plans are on file with the Town Clerk, Brooklyn.

Westbrook Township, about 4365 lin.ft. native stone macadam or graded construction (also a resurfacing contract) on the Essex road. Plans are on file with the Town Clerk, Westbrook.

Essex Township, about 12,000 lin.ft. trap rock or native stone macadam construction on the Westbrook Road. Plans are on file with the Town Clerk, Essex.

About 24,555 lin.ft. wood guard railing in Salesbury, Kent, Woodstock, Easeford and Chaplin Townships.

✚Contracts for state road work have been awarded by the State Highway Commissioner as follows:

East Windsor Township, about 7525 lin.ft. special macadam-gravel road, to the AHERN CONSTRUCTION CORPORATION, for approximately $8000.

Killingly Township, about 5537 lin.ft. native stone macadam construction, to the NEW LONDON CONSTRUCTION CO., New London.

Waterbury City, about 3500 lin.ft. reinforced-concrete construction on the Watertown Road, to the CONNECTICUT GOOD ROADS & IMPROVEMENT CO., New Britain.

New London City, a section of reinforced-concrete construction on Williams St., for $12,273, and a section of bitu-

minous macadam construction on Broad St., for $1016, to B. D. PURD, JR., CO., Bridgeport.

Simsbury Township, a section of gravel construction on the Poindexter Bridge Road, to STAFFORD & MATHER, Hartford, for $7346, and a section of special trap rock macadam construction on the West Simsbury Road, to OLIN T. BENEDICT, Pittsfield, Mass., for $6001.

Cheshire Township, a section of concrete construction on Maple Ave., to the A. C. STERNBERG, JR., CONSTRUCTION CO., West Hartford, for about $8700.

Seymour Township, sections of hassam pavement on Broad and Dey Sts., to the CONNECTICUT HASSAM PAVING CO., New Haven, for about $10,213.

Milford Township, a section of concrete road on New Haven Ave., to FRANK ARRIGOIN & BRO., Middletown, for about $14,212. Noted May 28 and June 11.

Contracts for railings have been awarded as follows: HARRIS WHITEMORE, Naugatuck, Conn., $4840; MALLET & WARNER, Bridgeport, $1255; WILLIAM J. WALL, Torington, $2200; FRANK A. WILCOX, Norwich, $1325.

✚**New London, Conn.**—Contracts for paving William St. with concrete and Broad St. with bituminous macadam have been awarded to B. D. PIERCE, JR. CO., Bridgeport, at $12,273 and $10,016 respectively. Noted May 28 and June 11.

Seymour, Conn.—The Town Council contemplates paving several streets with bituminous macadam at an estimated cost of $14,000.

✚**Stafford, Conn.**—The contract for building 4500 ft. of bituminous stone road on West Main St. has been awarded to A. D. BRIDGE'S SONS, INC., Hazardville, at $8779.

★**Albany, N. Y.**—Bids will be received by John N. Carlisle, State Highway Comr., until 1 p.m., July 6, for improving and repairing highways in various counties. For particulars, see advertisement under "Contracts to Be Let."

★**Corning, N. Y.**—(Official)—Bids will be received by the Commissioners of Public Works until noon July 2, for paving Market and State Sts. Approximately 17,000 sq.yd. of paving will be required. William O. Drake is Supt. of Pub. Wks.

Roslyn, L. I., N. Y.—The Town Board contemplates constructing sidewalks on Willow, Garden Sts., Warner Ave. and St. Marks Pl.

✚**Troy, N. Y.**—The contract for paving Hutton St. has been awarded to JOHN W. DAVITT at $14,793.

Haddonfield, N. J.—The Board of Chosen Freeholders, Camden plans to improve the Kings Highway in this vicinity.

✚**Hopewell, N. J.**—The contract for constructing the Hopewell Valley section of the Mt. Rosedale-Hopewell Road, four miles long has been awarded by the State Road Commission, Trenton to RUSSELL KLOCKNER.

Linden, N. J.—(Official)—Bids will be received by Borough Council until 8 p.m., June 30, for macadamizing Curtis St. from Wood Ave. to the Borough Line, Hussa St. from Blancke St. to the Borough Line, Elizabeth Ave. from Stiles St. to Borough Line and Lumber St. from Blancke St. to Elizabeth Ave. Clarence H. Smith is Borough Clk.

Newark, N. J.—Bids will be received by the Board of Chosen Freeholders until July 1 for resurfacing Pompton Turnpike from Bloomfield Ave. to the Passaic County Line. Frederic A. Reimer is County Engr.

Newark, N. J.—The Board of Freeholders plans to improve the Morris Ave. Turnpike at an approximate cost of $18,000.

Newark, N. J.—The Board of Public Works will improve South Orange Ave. from South Tenth St. to the city line with asphalt block paving.

Trenton, N. J.—Bids will be received by the City Commissioner, until June 26, for paving various streets with bituminous macadam and granite block. Frank Thompson is City Clk.

✚**Harrisburg, Penn.**—(Official)—Bids were received June 16, by the State Department of Highways as follows: Chester County, East Bradford Township, 17,103 ft., asphaltic bituminous macadam (penetration method) for 16,388 ft. and one-course concrete roadway for 715 ft.: Corcoran Construction Co., West Chester, $57,562; M. & T. E. Farrell, West Chester, $72,221; William C. Evans, Ambler, $64,961; R. H. Johnson Co., Wayne, $54,366; Neff, Horn & Co., Slatington, $59,828; M. BENNETT & SONS, Indiana, $52,612 (awarded contract). Chester County, Kennett Township, 15,272 ft. asphaltic bituminous macadam (penetration method): George C. Souder, Lancaster, $60,379; D. E. O'CONNELL & SONS, Avondale, $48,554 (awarded contract); Ernest Palmer, Wallingford, $70,790; Ambler-Davis Co., Philadelphia, $56,510; Edward L. Bader, Philadelphia, $66,362; William C. Evans, Ambler, $59,422; B. F. Wickersham, Kennett Square, $56,632. Montgomery County, Upper Dublin Township, 3107 ft., asphaltic concrete on a telford foundation: D. Webster Anders, Philadelphia, $15,359; EDWARD L. BADER, Philadelphia, $10,338 (awarded contract); William C. Evans, Ambler, $14,425. Montgomery County, Abington & Cheltenham Townships, 10,354 ft. asphaltic bituminous macadam (penetration method), no award made: J. F. Shanley Co., Philadelphia, $31,049; Charles T. Eastburn Co., Yardley, $38,357; Edward L. Bader, Philadelphia, $37,947; Manwaring & Cummins, Philadelphia, $36,808; B. F. Richardson, Philadelphia, $30,563; Sigafoos & Poore, Riegelsville, $32,798; Ambler-Davis Co., Philadelphia, $30,964; D. Webster Anders, Philadelphia, $34,081; Neff, Horn & Co., Slatington, $37,137; S. Harper Dean, Fox Chase, Philadelphia, $39,937; William C. Evans, Ambler, $40,087. Cambria County, Barnesboro Borough, 6242 ft. brick block paving: BELL-BOCKEL CO., INC., Altoona, $25,418 (awarded contract); Hoblitzell & Price, Myersdale, $27,432; John Dandrea & Co., Patton, $34,177; E. H. Brua, Hollidaysburg, $29,256; Polo C. Azzara, Barnesboro, $26,629; Fogel & Co., Hollidaysburg, $31,103; John L. Elder, Ebensburg, $30,300. Cambria County, East Taylor Township and East Conemaugh Borough, 9185 ft. Alternate bids: (1) One-course concrete roadway; and brick block paving on a concrete foundation for portion in East Taylor Township, 6734 ft., (2) brick block paving on a concrete foundation for a portion in East Conemaugh Borough, 2451 ft.: Henry Bolar, McKeesport, (1) $50,770, (2) $58,388; Samuel Gamble Co., Carnegie, (1) $51,420, (2) $58,591; Monongahela Construction Co., Inc., Pittsburgh, (1) $47,043, (2) $49,144; BELL-BOCKEL CO., INC., Altoona, (1) $45,918, (2) $46,044 (awarded contract); John L. Elder, Ebensburg, (1) $46,751, (2) $52,663; Suppes Contracting Co., Inc., Johnstown, (1) $47,156, (2) $56,035; Baker-Owen Construction Co. Johnstown, (1) $60,319, (2) $62,737. Fayette County, Fayette City Borough, 1354 ft. brick block paving: Ridge Bros. Co., Pittsburgh, $8174; Thomas Arrigo, Charleroi, $7707; HOBLITZELL & PRICE, Myersdale, $6952 (awarded contract). York County, Stewartstown Borough, 5270 ft. asphaltic concrete on a concrete foundation: DWYER & CO., Philadelphia, $28,858 (awarded contract). York County, Hopewell Township, 15,264 ft. asphaltic bituminous macadam (penetration method): GEORGE C. SOUDER, Lancaster, $67,048 (awarded contract); Dwyer & Co., Philadelphia, $72,854. Lycoming County, Montgomery Borough, 5787 ft. brick block paving: W. H. Lyons, Sunbury, $40,669; Monroe Paving Co., Langhorne, $39,929; B. H. Coryell, Williamsport, $36,767; BUSCH & STEWART, Williamsport, $36,466 (awarded contract); G. W. Rockwell, Sunbury, $42,015. McKean County, Port Allegany Borough, 6272 ft. brick block paving: Simpson-Mitchell Co., Punxsutawney, $38,637; JOHN SHEEHAN & CO., Bradford, $36,939 (awarded contract). Tioga County, Mansfield Borough, 7464 ft. brick block paving: G. W. Rockwell, Sunbury, $61,677; G. W. Ensign, Inc., Harrisburg, $65,187; SIMPSON-MITCHELL CO., Punxsutawney, $48,398 (awarded contract); Empire Contractors' Material and Equipment Co., Inc., Newark, N. Y., $59,754; McNerney Construction Co., Canton, $56,507. Westmoreland County, Hempfield Township, Route 118, 325 ft. telford macadam (no award made): James H. Offutt, Greensburg, $3712; Ridge Bros. Co., Pittsburgh, $4690. Noted June 4.

✚**Rural Valley, Penn.**—(Official)—The contract for improving part of Main St. has been awarded to L. H. HILEMAN CO., Ford City, at $9820. Noted June 11.

Baltimore, Md.—Bids will be received by the Board of Awards, City Register's Office, until July 1, for grading, curbing and paving, and repaving on concrete base as follows: Granite block repaving on portions of Clay and Water Sts., Dark Lane and Lovegrove Alley, 5550 sq.yd. under contract No. 91; repaving under Contract 92, Eutaw St., from Baltimore St. to Madison Ave.; sheet asphalt, 8810 sq.yd., granite-block repaving 5680 sq.yd., granite or scoria block paving, 450 sy.yd., and vitrified block paving, 1300 sq.yd. R. Keith Compton is Consult. Engr.

✚Contracts have been awarded by the Board of Awards for paving: Riverside Ave., from Hamburg St. to Fort Ave., and eight streets and three alleys in the Northwestern Annex, to the BALTIMORE ASPHALT BLOCK & TILE CO., at $7635 and $37,508, respectively; 14 streets in the Northern and Northeastern Annex, to the AMERICAN PAVING & CONTRACTING CO., at $64,535.

✚Contracts have been awarded by the State Roads Commissioners, 601 Garrett Bldg., Baltimore, to LUCK CONSTRUCTION CO., Roanoke, Va., at $56,046, for a 14-ft. macadam road on Liberty Road, from Buck's Lane to Old Court Road, about 4.35 miles; also to P. FLANIGAN & SONS, 120 East Lexington St., Baltimore, at $65,707 for an asphalt pavement on Reistertown Road from Pimlico Road Circle to Baltimore County Line, about 1.25 miles. Noted May 28.

Easton, Md.—Bids will be received by the City Council until July 6, for grading and paving 20,000 sq.yd. of streets.

Richmond, Va.—Bids will be received by G. P. Coleman, State Highway Comr., until noon, July 2, for constructing 5.76 miles of gravel road in Henrico County.

Lillington, N. C.—An election will soon be held in Averysboro Township, Harnett County, to vote on the proposition to issue bonds for $30,000 for road construction.

Smithfield, N. C.—Bids will be received by the Board of County Commissioners of Johnston County until June 27 for the sale of $100,000 of Johnston County Township Road bonds.

Bushnell, Fla.—Bids will be received until July 14 for $15,000 street improvement bonds.

✚**Birmingham, Ala.**—Contracts have been awarded to the NALL CONSTRUCTION CO., at $18,512 and $20,171 for paving Third Ave. from 12th to Walker St. and South 19th St. from Ave H. to Nelson Ave. respectively and to the SOUTHERN BITULITHIC CO. at $3586 for paving Cottonwood Ave. from 18th to 19th St. Noted June 4.

Decatur, Ala.—(Official)—Bids will be received by the City Council until July 21 for asphalt macadam and gravel macadam street paving and concrete gutters and sidewalks. The estimated cost of the work is $149,000. E. W. Collier is City Clk. Noted June 4.

✚**Mobile, Ala.**—(Official)—The contract for constructing asphaltic concrete pavement has been awarded to F. G. PROUDFOOT, Chicago, Ill. and Mobile at $34,844. Other bids were: Bayley, Reeder & Co., $37,150; Dunn & Lallande Bros., Birmingham, $37,292 and the Southern Asphalt & Construction Co., Birmingham, $37,354. Noted May 21.

Kosciusko, Miss.—Bids will be received by the Board of Supervisors of Attala County until July 6 for the sale of $50,000 of District No. 1 road bonds.

Hammond City, La.—(Official)—Bids will be received by the Highway Department of the Board of State Engineers, Room 104, New Orleans Court Building, until noon, July 15, for constructing about 13 miles of public highway extending east and west through Hammond City and Tangipahoa Parish. W. E. Atkinson is State Highway Engr.

Pikeville, Ky.—Bids will be received by H. S. Damron, City Clk. until noon July 6 for the sale of $55,779 of bonds for street improvement.

Bowling Green, Ohio—Bids will be received by the County Audr. until July 14, for macadamizing roads in Portage, Plain, Center, Freedom, Troy, Montgomery, Ross and Lake Townships and the Village of Luckey.

✚**Cincinnati, Ohio**—(Official)—The contract for repairing Camargo Pike from Madisonville to Allendale, in Columbia and Sycamore Townships has been awarded to G. W. RICH, Loveland at $26,755. Noted May 28.

Cincinnati, Ohio—(Official)—Bids will be received by the County Commissioners until noon, July 17, for the improve-

ment of the New Richmond Pike, from the Three Mile Road to the County Line in Anderson Township.

(Official)—Bids will be received by the County Commissioners until 10 a.m., July 10, for repairing about 5000 ft. of the Harrison and New Haven Pike, from Paddy's Run easterly in Crosby Township.

Cleveland, Ohio—Bids will be received by Carl A. Palmer, Clk. of the Village of Shaker Heights, until July 14, for the improvement of East 128th St.

✚Columbus, Ohio—The following contracts were awarded by the State Highway Commissioner, June 16:

Lorain County, Medina-Norwalk, to the ELYRIA CONSTRUCTION CO., Elyria.

Erie County, Columbus-Sandusky, to E. F. HOFFMAN, Castalia, $4770.

Greene County. Dayton-Chillicothe, to THE WILSON ENGINEERING & CONTRACTING CO., Xenia, $31,788.

Lorain County. Ashland-Oberlin, to THOMAS BURTON & SONS, Wellington, $23,673.

Lorain County. Milan-Elyria, to THE ELYRIA CONSTRUCTION CO., Elyria, $44,550.

Champaign County. Urbana-West Jefferson, to JOHN S. SHEEDY, Urbana, $8481.

Washington County, Hockingport-Powhatan, "H" to McGERRY & STOWE, Akron, $10,100.

Washington County, Hockingport-Powhatan, "G" to McGERRY & STOWE, 11-15 Balch St., Akron, $15,990.

Muskingum County. Zanesville-Cincinnati, to A. EMORY & SONS, Zanesville, $17,300.

Champaign County. Piqua-Urbana, to BREWER, TOMLINSON & BREWER, Chillicothe, $14,099.

Champaign County. Urbana-Sidney, to BREWER, TOMLINSON & BREWER, Chillicothe, $10,084.

Columbiana County. Salem-Hanoverton, to McLANE & HEPBURN, Lisbon, $15,893.

Tuscarawas County, Urichsville-Philadelphia to THE WM. BRODE CO., New Comerstown, $30,903.

Wayne County. Wooster-Mansfield, to WM. H. DEWELL, Creston, $43,228.

Wayne County. Orrville-Northern, to H. D. SHANNON, Orrville, $26,900.

Athens County. Athens-McArthur, to ABNER JUNIPER, Nelsonville, $38,869.

Medina County. Medina-Wooster, to GEO. S. MELLERT, Medina, $2724.

Trumbull County. Youngstown-Cleveland, to WM. M. KUSECKER, Youngstown, $68,305.

Summit County. Akron-Kent, to ECKROAD, HERBAUGH & PAYNE, Akron, $47,400.

Lorain County. Medina-Norwalk, to THE ELYRIA CONSTRUCTION CO., Elyria, $24,750.

Medina County. Medina-Norwalk, to LEE GRIGGS & ANDERSON, Millersburg, $9880.

Mahoning County. Youngstown-Salem, to the FLEMING, HAHN PLATT CO., Youngstown, Ohio, $11,300.

Lake County. Cleveland-Buffalo, to B. A. FRESHWATER & SONS, Chester, W. Va., $69,295.

Washington County. Marietta-McConnelsville, to McGERRY & STOWE, 11 Balch St., Akron, $29,490.

Lorain County. Ashland-Oberlin, to THOS. BURTON & SONS, Wellington, $8212.

Perry County. New Lexington-Logan, to the WILSON CONTRACTING CO., Xenia, $34,099.

Wyandot County. Upper Sandusky-Findlay, to the NATIONAL LIME & STONE CO., Carey, $20,625.

Trumbull County. Youngstown-Conneaut, to B. F. HEWITT, Jefferson, $28,000.

Fayette Cunty. Hillsboro-Washington, to GRAHAM & KINNEAR, Columbus, $16,700.

Trumbull County. Youngstown-Cleveland, to WM. M. KUSECKER, Youngstown, $55,766.

Wayne County. Wooster-Massillon, to the MIDLAND CONSTRUCTION CO., Lima, $52,563.

Harrison County. Bridgeport-Cadiz, to J. P. WARNICK, Cadiz, $23,374.

✚Dayton, Ohio—The contract for improving 2½ miles of Cincinnati Pike has been awarded to McINTIRE & SCHWANK, at $43,000.

East Liverpool, Ohio—(Official)—Bids will be received by E. J. Smith, Dir. of Pub. Ser., City Hall, until noon, June 27, for paving Lincoln Ave. from Grant to Wall St.

✚Lakewood, Ohio—Contracts for paving Cranford and Fry Aves. have been awarded to the CLEVELAND PAVING & CONSTRUCTION CO., Cleveland, at $22,235 and $9671 respectively and Romona Ave. to PACE BROS., 1241 West 112th St., Cleveland, at $11,443.

✚Lancaster, Ohio—The contract for paving Columbus St. from a point near Park St. to Forest Rose Cemetery entrance has been awarded to WILSON & BOWERS, Lancaster at $11,789.

Marysville, Ohio—Bids will be received by Charles A. Morelock, Union County Audr., until June 27 for grading, draining and macadamizing the Highland and Croy Roads in Jerome Township. It will be 3.67 miles.

✚Massillon, Ohio—The contract for paving Wooster St. has been awarded to the McCARRY & STOWE CO., Akron at $22,500.

Mineral City, Ohio—Bids will be received by C. E. Kugler, Village Clk., until July 6, for grading, curbing and paving North High St.

Niles, Ohio—Bids will be received by J. H. Cowdrey, Dir. of Pub. Ser., until June 30, for constructing brick or tar macadam pavement on Belmont, Bentley, Lindell, Hartzell, Cherry, Washington, Maple and Sayres Aves.

Nova, Ohio—(Official)—Bids will be received by John W. Davidson, Township Clk. until noon, June 27, for grading, draining and constructing 4¾ miles of bituminous bound macadam road.

✚Anderson, Ind.—The contract for paving Chestnut, 8th, Milton and Grand Aves. has been awarded to DANIELS & LYST, at $34,328.

✚Batesville, Ind.—(Official)—The contract for improving Pearl St. has been awarded to WILLIAM F. KRIEGER at $6390. Noted June 4.

Columbus, Ind.—(Official)—Bids will be received by the Commissioners of Bartholomew County until 10 a.m., July 7, for a ten-ton steam road roller with attachments. Philip J. Sater is Audr.

Evansville, Ind.—Bids will be received by Carl Lauenstein, Treas., Vanderburgh County, until 10 a.m., July 6, for the sale of $33,000 of bonds for highway improvement.

✚Frankfort, Ind.—(Official)—Contracts have been awarded for paving Armstrong St. with reinforced concrete to WILLIAM COIN, at $27,611. Other bids were Willis Hauser, $34,647; Nees & Seaman, $30,771, and Lawrence Sheridan, $37,146. East South St. with brick to J. J. KELLEHER & CO., at $11,827. Other bids were: Good & Lee, $12,016; William Coin, $12,079, and Nees & Seaman, $12,424. East Barner and North Clay Sts. with asphaltic macadam to NEES & SEAMAN, at $7423 and $2842 respectively.

✚Goshen, Ind.—The contracts for paving Vistula Ave. with concrete and West Market St. and Locke Union Township Line Rd. with gravel have been awarded to the NORTHERN CONSTRUCTION CO., Elkhart, at $36,600, and the NORTHERN INDIANA CONSTRUCTION CO., East Chicago, at $54,800 respectively.

✚Knightstown, Ind.—The contract for grading, paving and curbing Jefferson and Clay Sts. has been awarded to C. M. KIRKPATRICK at $48,257.

Logansport, Ind.—(Official)—Bids will be received by M. M. Minnick, Treas. of Cass County until 10 a.m., June 27, for the sale of $6500 and $18,000 of bonds for highway improvement.

Monticello, Ind.—(Official)—Bids will be received by A. G. Fisher, County Audr. until 10 a.m., July 7, for improving the Noland and Hughes stone roads.

Monticello, Ind.—Bids will be received by O. C. Middlestadt, Treas., White County, until 10 a.m., July 1, for the sale of $14,000, $4400 and $3800 of bonds for road improvement.

Roanoke, Ind.—The City Council has decided to pave West Second St. with concrete and First, Hugh and South Main Sts. with brick.

Wabash, Ind.—(Official)—Bids will be received by N. P. Lavengood, Treas., until 5 p.m., July 1, for the sale of $13,200 and $10,720 of bonds for gravel roads.

✚Bedford, Mich.—A contract for street paving has been awarded to LENANE BROS., Detroit, at $40,000.

✚Detroit, Mich.—(Official)—Contracts have been awarded by the Department of Public Works for paving: Parker, St. Clair and Fischer Aves. to T. E. CURRIE, at $12,078; $8372 and $15,195 respectively; McClellan Ave. to J. A. MERCIER, at $21,179 and Alexandrine Ave. to the DETROIT ASPHALT PAVING CO., at $8860.

Ludington, Mich.—Paving bonds to the amount of $18,400 were recently sold.

Menominee, Mich.—Bonds to the amount of $60,000 were recently voted for road improvements.

✚Norway, Mich.—The contract for paving Nelson St. with crushed rock bituminous macadam has been awarded to BYRON W. HICKS, Vulcan at $7300.

Reese, Mich.—Denmark Township has sold $20,000 road bonds.

✚Anna, Ill.—The contract for the central paving district has been awarded to the GRANITE CITY LIME & CEMENT CO., Granite City at $54,081. Other bids were Prosser & Halliday, Cairo, $55,550; Meyer & Thomas Construction Co., East St. Louis $54,582; Foulkes Construction Co.; Terre Haute, Ind., $54,491 and the Public Construction Co., $54,830.

Chicago, Ill.—(Official)—Bids will be received by the Board of Local Improvements, Room 207, City Hall, until 11 a.m., July 1, for improving a number of streets. Francis D. Commery is City Clk.

★Rockford, Ill.—(Official)—Bids will be received by W. W. Bennett, Pres. of Bd. of Local Impvt. until 11 a.m., June 26, for constructing 1815 sq.yd. macadam pavement, 9275 sq.yd. brick pavement and 6215 lin.ft. of concrete curb and gutter; also 2028 ft. of 12-in. sewer, 910 ft. of 15-in. sewer, 1782 ft. of 10-in. sewer and 1139 ft. of 9-in. sewer.

Springfield, Ill.—Bids will be received by the State Highway Commission until July 1 for State Aid work in 12 counties. A. N. Johnson is State Highway Engr.

Dodgeville, Wis.—Bids will be received by Jhn P. Lewis, City Clk., until 7 p.m., June 29, for approximately 30,000 sq.ft. of concrete walks.

✚La Crosse, Wis.—(Official)—The contract for paving Third St. with brick has been awarded to the LA CROSSE STONE CO. at $11,740. Other bids were: N. C. Bacheller, $11,900, Western Construction Co., $13,126 and T. E. Wooley, $12,134. Noted May 21.

Marinette, Wis.—Bids will be received by A. H. Holquist, Chn. of Bd. Pub. Wks. until 2 p.m., July 11, for improving Division and Shields Sts.

✚Milwaukee, Wis.—Contracts have been awarded to the D. M. SHELDON CO., at $13,823 for paving Lincoln Ave. from Kinnickinnic to Greenbush St.; to the DEAN CONSTRUCTION CO., at $47,753 for paving St. Paul Ave. from 16th to 25th St. and to HASE & WUIHLER CO. at $12,285 for paving State St. from 18th to 23rd St.

✚Milwaukee, Wis.—Contracts for street paving have been awarded as follows: to BADGER CONSTRUCTION CO., at $5115, $3282 and $7422 and $27,377 for 38th, 45th, 44th and Fourth Sts. respectively; to F. P. COUGHLIN, at $10,250, 07825 and $18,215 for Lincoln, National Aves. and Cherry St. respectively and to the WHITE CONSTRUCTION CO., at $4320 for 25th Ave.

✚Superior, Wis.—The contract for improving Iowa Ave. has been awarded to MAGNUS PETERSON, at $16,531. Other bids were Riches & Son, $16,947; E. Johnson, $16,992, and P. E. Bergman, $17,289.

Red Lake Falls, Minn.—Bids will be received by George Dupont Audr, Red Lake County, until 2 p.m., July 13 for constructing 10 miles of road.

Sleepy Eye, Minn.—Bids will be received by H. C. Peterson, City Recdr., until 8 p.m., July 7, for concrete streets and alley crossings.

Worthington, Minn.—Bids will be received by Gus Swanberg, Nobles County Audr., until 2 p.m., July 13, for grading, constructing turnpikes, ditches and concrete culverts. D. E. Davison is Dist. Engr.

✚Atchison, Kan.—The contract for paving Commercial St. from 9th to 13th St. has been awarded to S. E. WILCOX of the Alpine Construction Co., at $11,804.

Horton, Kan.—(Official)—Bids will be received by J. F. Bailey, Mayor, until 8 p.m., July 14, for paving nine blocks. Noted June 18.

Wheeler, S. D.—Bids will be received by F. J. Kaberna, County Audr., until 2 p.m., July 8, for grading certain highways.

Lewistown, Mont.—Bids will be received by the City Clerk until 2 p.m., June 28, for paving Janeaux St. The estimated cost is $50,000.

Texarkana, Ark.—An expenditure of $200,000 is contemplated for constructing 250,000 sq.yd. of asphalt macadam pavement in Improvement District No. 20.

Cameron, Tex.—(Official)—Bids will be received until July 15 for constructing a system of improved highways in Road Dist. No. 2, Milam County. Approximately $150,000 is available. The J. C. Field Engineering Co., 105 Field Bldg., Denison, is Engr.-in-Charge.

Ennis, Tex.—The city is negotiating the sale of $80,000 paving bonds.

✚McKinney, Tex.—The contract for paving South Tennessee and Louisiana Sts. has been awarded to LEVY & LEVY, Muskogee, Okla. at $27,500.

Ozona, Tex.—Bids will be received by the County Commissioners until July 13 for the purchase of $27,000 of road bonds.

Paris, Tex.—The City Council has voted to pave Grand Ave., South 20th, South 23rd, South 25th and South 26th streets at approximately $110,000.

Rockport, Tex.—Bonds to the amount of $25,000 have been voted for road improvements.

✚Collinsville, Okla.—(Official)—The contract for laying approximately 34,000 sq.yd. of brick pavement with concrete base has been awarded to C. A. WILLISTON, Chicago, Ill., at $83,000. Other bids were: Western Paving Co., Oklahoma City, and M. A. Swatek & Co., Oklahoma City. The Benham Engineering Co., Oklahoma City, is Engr. Noted Mar. 26, May 14 and June 4.

Boise City, Idaho—Bonds to the amount of $58,000 were sold June 9. The proceeds will be used for sidewalks, curbing and paving.

✚Montesano, Wash.—The contract for graveling the Quinalt has been awarded to the STANDARD TRANSFER CO., at $22,000.

✚Newport, Wash.—The contract for paving 6800 ft. of permanent highway connecting Usk and Cusick Townships has been awarded to J. W. HASTINGS, at $7851.

Pullman, Wash.—Bids will be received by the City Clerk until July 7 for paving Dist. 16. L. V. Edwards is City Engr.

✚Redmond, Wash.—The contract for paving two miles of Redmond-Snoqualmie Road has been awarded to L. R. ELLIS, Seattle, at $41,435.

Seattle, Wash.—According to press reports bids will be received by the County Commissioners until July 6 for constructing 27½ miles of Cascade Scenic Highway. The estimated cost is $160,000.

Seattle, Wash.—Bids will be received by the Board of County Commissioners until June 30 for improving the James McKay Road.

Shelton, Wash.—Bids will be received by the County Commissioners until June 27 for constructing Permanent Highway No. 2.

Carlton, Ore.—The City Council is preparing to receive bids for street paving. The approximate cost of the work is $50,000.

✚Dayton, Ore.—(Official)—The contract for improving Ferry St. has been awarded to the ARENZ CONSTRUCTION CO., Salem at $9376. Other bids were: V. R. Dennis, $9464; Vancouver Construction Co., $9877 and M. M. Phipps, $10,104. Noted May 21.

✚Tillamook, Ore.—The contract for constructing ½ mile of pavement North of Hall Slough has been awarded to DELSMAN & DOLAN at $6717.

✚Inglewood, Calif.—The contract for improving Flower St. from Nutwood to Vitae St. has been awarded to GEORGE SNIDER at $9121.

✚Lindsay, Calif.—The contract for improving the streets in the business district has been awarded to the FEDERAL CONSTRUCTION CO., San Francisco, at $50,000.

✚Los Angeles, Calif.—The contract for improving Kingsley Drive from Third St. to Wilshore Blvd. has been awarded to the FAIRCHILD-GILMORE-WILTON CO., at $18,635.

✚Manhattan Beach, Calif.—Contracts for improving parts of the following streets: 32d, 33d and 16th, have been awarded to the BARBER ASPHALT PAVING CO., 717 Brockman Bldg., Los Angeles, at $8757 for the first two and $9209 for 16th St.

✚Sacramento, Calif.—Contracts for constructing roads in various counties have been awarded as follows:

Solano County, 8.8 and 9 miles of concrete pavement to COMMAR-PETERSON CO., San Francisco, at $49,572 and $56,410. Noted May 14 and June 4.

Ventura County, about 5.1 miles of concrete pavement to MODERN CONSTRUCTION CO., Los Angeles, at $35,516. Noted Apr. 2 and 30.

Los Angeles County, 12.7 miles of concrete pavement to LEE MOORE, Los Angeles, at $153,019. Noted May 14 and June 4.

Butte County, about 11.2 miles of concrete pavement to P. L. BURR, San Francisco, at $55,613. Noted May 21 and June 18.

Tehama County, about 8.8 miles of concrete pavement to M. JACINTO, at $53,679. Noted May 21 and June 18.

Glenn County, about seven miles of concrete pavement to P. H. HOARE, Oakland, at $37,210. Noted May 21 and June

Shasta County, about 9.9 miles of grading to H. ROLA San Francisco, at $63,245. Noted May 21 and June 18.

Humboldt County, 7.3 miles of grading to FRANK SMITH & G. W. CONNORS, at $67,865. Noted May 14 June 4.

Santa Clara County, six miles of concrete pavement to H. L. PETERSON & A. J. GRIER, San Francisco, at $38 Noted May 14 and June 4.

Sacramento, Calif.—(Official)—Bids were received June by the State Highway Commission for constructing a in Yolo County as follows: Grant Fee, San Francisco, $2 461; Carl Leonardt and Louis Mesmer, Los Angeles, $314,6 San Francisco Bridge Co., San Francisco, $328,435; Van Houghton Co., San Francisco, $250,415; Sound Construction Engineering Co., San Francisco, $257,836, and the Snare Triest Co., New York, N. Y., $387,340.

Sacramento, Calif.—(Official)—Bids will be received by the State Highway Commission, Forum Bldg., for constructing the following highways:

Until 11 a.m., July 6, Tehama County, from the southerly boundary to Los Molinos, about 10.6 miles concrete. Yolo County, from the southerly boundary to Woodland, about 11.7 miles, concrete. Santa Cruz County, from Glenwood to Santa Cruz, about 10.3 miles, graded. Santa Barbara County, from Orcutt to Santa Maria, about 6.5 miles, concrete. San Benito County, from San Juan Bautista to the northerly boundary, about four miles, concrete.

Until 2 p.m., July 6: Shasta County from Bayha to the Sacramento River, about 16.2 miles, graded. San Luis Obispo County from Arroyo Grande to San Luis Obispo, about 13.4 miles, concrete. Kern County from Grape Vine Creek to Sections 5 and 6, T. 32 S., R. 28 E. M. D. B. and M., about 17.3 miles, concrete. Ventura County from Newbury Park to Springville, about 11.1 miles, concrete. San Diego County from La Mesa to El Cajon, about 1.6 miles, concrete. Austin B. Fletcher is Highway Engr.

✚San Diego, Calif.—The contracts for constructing gutters and culverts on Rosecrans St. and for grading Langley St. have been awarded to G. R. DALEY at $13,355 and $4728 respectively.

✚San Diego, Calif.—The contract for the grading of Hayes, Vermont and Johnson Sts. and the lowering of sewers has been awarded to J. W. CALBACK at $8274.

San Francisco, Calif.—Bids will be received by the Board of Public Works until July 1 for improving 29th Ave. from Clement to California St. F. J. Churchill is Secy. of the Board.

Richmond, Que.—Bids will be received by E. F. Cleveland, Secy.-Treas., until 8 p.m., July 6, for bituminous macadam pavement, concrete sidewalks and gutter and crushed stone or gravel macadam streets.

✚Ft. William, Ont.—A contract for constructing asphaltic concrete pavement has been awarded to the NATIONAL PAVING & CONTRACTING CO., Winnipeg.

INDUSTRIAL WORKS

Derby Line, Vt.—The Union Twist Drill Co., Athol, Mass., will build two additions to its local plant. Frost & Chamberlain, State Mutual Bldg., Worcester, Mass., have prepared the plans. Noted Apr. 23.

✚Haverhill, Mass.—The Essex Associates, Locke and Essex Sts., have awarded a contract to KELLEY BROS., 24 Pleasant St., for an eight-story, brick factory. The cost is estimated at $125,000. E. N. Gilman is Pres. of the Essex Associates. Damon Bros., 25 Washington St., are the Archs.

✚Haverhill, Mass.—The Riker-Jaynes Drug Co., 27 Haymarket Sq., has awarded a contract to the NATIONAL FIREPROOFING CO., 200 Devonshire St. for a ten-story, concrete factory and warehouse, 100x200 ft. Arthur H. Bowditch, 44 Bromfield St., is the Arch.

Worcester, Mass.—The Armour Packing Co., Chicago, Ill., is having plans prepared for a three-story, brick, cold-storage warehouse, to be built here on Summer St.

Ansonia, Conn.—The American Brass Co. plans to build several additions to its plant; one will be two-story and 30x36 ft., another two-story, 60x200 ft., another four-story, 40x125 ft. and a fourth one-story, 57x92 ft. The total cost will be about $150,000. James R. Coe is Ch. Eng.

✚Bridgeport, Conn.—The Salts Textile Mfg. Co., Kossuth St., will construct two new brick and steel buildings; one is one-story, 32x151 ft. and the other is three-story and 56x97 ft. The DOWLING & BOTTOMLY CO. has been awarded the contract for the masonry and the SCHWARZ BROS. CO., the contract for the carpentry.

Bridgeport, Conn.—The American Chain Co., Logan St. and Connecticut Ave., is receiving bids for a three-story and basement, brick, concrete and steel factory and office building. It will be 30x100 ft. Skinner & Walker, 421 Newfield Bldg., are the Archs.

Waterbury, Conn.—The A. H. Wells Co., Watertown Ave., is receiving bids on a brick and steel, 70x90 ft. addition to its brass tubing mill. Theodore B. Peck, 65 Bank St., is the Arch.

✚Waterbury, Conn.—The Plume & Atwood Mfg. Co. has awarded contracts for its five-story, 50x180-ft. addition to its factory to CHALFIELD & CHALFIELD, masonry, and TRACY BROS. CO., carpentry. Noted June 11.

New York, N. Y.—(Borough of Manhattan)—James P. Whiskerman has filed plans for a four-story garage, to be built at 528 West 162nd St. It will be 100x100 ft. and cost $55,000.

New York, N. Y.—(Official)—(Borough of Manhattan)—The Automobile Club of America, 247 West 54th St., will build a four- and five-story garage, covering an area of 25,500 sq.ft. The cost will be $250,000. The automobiles will mount from floor to floor by means of romps or runways. A sprinkler system and a compressed air apparatus, serving all floors, will be installed. William H. Gompert, 171 Madison Ave., is the Arch.

Niagara, N. Y.—The Santo Rubber Co., Oliver Bldg., Pittsburgh, Penn., is receiving bids for the first of a number of buildings it will erect here. Its ground area will be about half an acre.

Rochester, N. Y.—The Erie Foundry Co. will build two additions to its plant. One, a moulding room, will be 30x145 ft., and the other a cleaning shop, will be 40x100 ft.

Rome, N. Y.—The Armour Packing Co., Chicago, Ill., plans to build a $40,000 building.

+Bloomfield, N. J.—The Condensite Co. has awarded a general contract for five one-story brick mill construction buildings, to EUSTICE BROS. The cost will be $22,703. Percy B. Taylor, Newark, is Engr. Noted June 11.

Camden, N. J.—The Victor Talking Machine Co., Cooper St., will build a five-story addition to its plant. It will be 91x241 ft. Ballinger & Perrot, Philadelphia, Penn., are the Archs.

Butler, Penn.—Spang & Co., will build a four-story concrete factory, 60x145 ft., with a wing 60x70 ft.

+Philadelphia, Penn.—Thomas Janney has awarded a contract to IRWIN & LEIGHTON, 126 North 12th St., for a $115,000 factory at Kirk St. and the Delaware River.

Philadelphia, Penn.—The Philadelphia Paint Mfg. Co. has filed plans for a two-story brick factory, to be built on South Ave. The cost will be $10,000.

Reading, Penn.—Frank Kalb has purchased a site at 214 to 224 Hamilton St., on which he will build a $300,000 bakery.

+Scranton, Penn.—The Lackawanna Mills have awarded a contract to the E. C. WILLIAMS CO., Coal Exchange Bldg., for a $20,000 factory addition. Edward Langley is Arch.

Baltimore, Md.—The City Dairy Co. will build a dairy, ice cream plant, office, shops, stables, etc., all of concrete. The cost will be about $250,000.

The Gandy Belting Co. will build a six-story industrial building, at West Lombard St. and Fremont Ave. The cost is estimated at $140,000.

+Baltimore, Md.—The Maryland Brass & Metal Co., Guilford Ave. and Federal Sts., has awarded a contract to JAMES SMITH, 1604 Broadway, for a two-story brick and concrete warehouse and factory. Callis & Callis, 2057 Kennedy Ave., are the Archs.

Huntington, W. Va.—Verus T. Ritter plans to build a three-story warehouse, 50x90 ft.

Wheeling, W. Va.—The F. Schenk & Sons Packing Co. will build a $30,000 addition to its cannery. It will have an area of 73,000 sq.ft.

Wilson, N. C.—Hackney Bros., will build a two-story factory, 100x500 ft.

+Columbus, Ga.—The Meritas Mills will build a 50x120 ft. addition to its weaving shed. The cost will be $15,000. The contract has been let to T. C. THOMPSON & BROS., Birmingham, Ala.

+Macon, Ga.—R. H. SMALLING & SON have been awarded a contract by Richard Willingham and others for five cotton warehauses. Four will be 75x80 ft. and one 160x600 ft. The cost will be $35,000.

Birmingham, Ala.—The Tennessee Coal, Iron & R.R. Co. will build a $300,000 addition to its plant. George Gordon Crawford is Pres.

The Birmingham Publishing Co. plans a printing plant at Ave. B and 19th St. It will be two-story, 100x100 ft. and of reinforced concrete.

+North Birmingham, Ala.—The CONSOLIDATED ENGINEERING CO., has been awarded a contract by the Southern R.R. for a brick and concrete roundhouse. The cost will be $75,000.

Selma, Ala.—Local press reports state that the Valley Creek Cotton Mills Co. has acquired 20 acres, adjoining its plant, and will build extensive additions.

New Orleans, La.—The Philadelphia Quartz Co. will build a factory. The estimated cost is $250,000.

Memphis, Tenn.—The Memphis Queensware Co., Georgia and Kentucky Aves., will build an $18,000 warehouse, 120x265 ft. G. M. Shaw is the Arch.

Lexington, Ky.—It is reported that the Louisville & Nashville R.R. will build a machine shop, a roundhouse and make other improvements at its local yards. W. H. Courtenay, Louisville, Ky., is Ch. Engr.

Barberton, Ohio—The Standard Motor Co. plans a $15,000 building.

Cincinnati, Ohio—The Andrew Jergens Co., Alfred Ave., has filed plans for a four-story, 99x120 ft., reinforced concrete factory and office building. The cost will be $45,000. Noted Apr. 30.

Cincinnati, Ohio—The N. Manichewitz Co., Eighth St. and the C. H. & D. Ry., will build an addition. It will be four stories 83x100 ft.

+Cincinnati, Ohio—BENJAMIN EVANS, 2101 Montgomery Rd., has been awarded a contract for a bakery. The main building will be 55x101 ft. Henry Crosby is the Arch.

+Cleveland, Ohio—The Cleveland Railway Co., Leader-News Bldg., has awarded a contract for a car repair shop to the W. I. THOMPSON & SON CO., 6110 Euclid Ave. The cost will be $557,000. Noted June 4.

+Cleveland, Ohio—The TIDEWATER CONSTRUCTION CO. 1111 Huron Road, has been awarded a contract for an eight-story addition to the cold-storage plant of the Sheriff St. Market & Storage Co.

+Cleveland, Ohio—The REAUGH CONSTRUCTION CO., 2835 East 51st St., has been awarded a contract for a six-story, 60x80 ft., brick, storage warehouse. The cost will be about $50,000. E. T. Gibbons, 1900 Euclid Ave., is the Arch.

Cleveland, Ohio—(Correction)—The address of F. C. Smith, to whom the G. A. Tinnerman Steel Range Co. awarded a contract for a three-story, 70x110-ft. factory, was erroneously noted June 25. It should read Kammo Corners, Ohio.

The Schuster Co., 2214 Fourth St., plans a four-story, 20x160-ft. warehouse. E. L. Schuster is Pres. G. B. Bahn, 1629 Williamson Bldg., is Arch. The cost is estimated at $50,000.

The Home Financing Co., care of Mudge & Beach, 219 Williamson Bldg., will build an eight-story, 214x330-ft. and 71x222-ft. warehouse. The cost is estimated at $500,000. Fulton & Taylor, 704 Permanent Bldg., are Archs.

+Toledo, Ohio—J. B. Breyman has awarded a contract to the SCHMIDT-HARVARD CO., for a $28,000 brick and concrete factory, to be built at 1025 Front St.

Buchanan, Mich.—The Celfor Tool Co. will soon start the construction of an addition to its plant. It will be one story and 100x160 ft.

Detroit, Mich.—Benjamin Siegel is building a one-story addition to his garage at Woodward Ave. and Brady Sts. It will be 100x120 ft.

+Detroit, Mich.—Leonard Reliable Storage Co. has awarded a contract to the A. J. SMITH CONSTRUCTION CO., 18 Campan Bldg., for two warehouses, one four and the other five story. The cost is estimated at $100,000. Noted Apr. 2.

+The Ford Motor Co. has awarded a contract to IRWIN & LEIGHTON, 1330 Dime Bank Bldg., for a four-story and basement, 140x297 ft., service building. The cost will be $280,000. Noted Mar. 5.

+Detroit, Mich.—The General Aluminum & Brass Mfg. Co., Grand Blvd., has awarded a contract to the NATIONAL CONSTRUCTION CO., 1026 Dime Bank Bldg., for a three-story, 60x120 ft., machine shop. The cost will be $45,000.

Minneapolis, Minn.—The Slocum-Bergren Co., Third St. and Sixth Ave., will build a three-story warehouse, costing $125,000. A. M. Slocum is Pres.

Kansas City, Mo.—The L. G. Lebrecht Co. will build a four-story, concrete warehouse at Ninth and Mulberry Sts.

+St. Louis, Mo.—The Skinner & Kennedy Stationary Co., 312 North Broadway, has awarded a contract to the PELLI-GREEN CONSTRUCTION CO. for a seven-story and basement 50x100 ft. brick building. The cost will be $75,000.

+Dallas, Tex.—C. A. Bryant has let a contract to BUCHANAN & GILDER, Fort Worth, Tex., for a three-story and basement, 71x90 ft. concrete and hollow tile warehause. The cost will be $28,000. C. W. Bulger & Son are the Archs.

Fort Worth, Tex.—The Crauch Hardware Co., 1007 Main St., will build a three-story, brick warehouse. The cost will be about $30,000.

Fort Worth, Tex.—The Northwestern Compress Co. will build a one-story, concrete warehouse. It will cost $55,000.

+Galveston, Tex.—The Merchants Planters Compress & Warehouse Co. has awarded a contract to the GILSONITE CONSTRUCTION CO., St. Louis, Mo., for a $750,000 cotton warehouse. It will cover six city blocks.

Texas City, Tex.—The Southwestern Steel Development Co., Galveston, Tex., recently incorporated for $30,000,000, will build a steel plant here to be one of the largest in the South. It will include steel mills, rolling mills, coking plant and blast furnace.

Fresno, Calif.—Cobb Bros., are receiving bids for the construction of a brick garage at Inyo and I Sts. The structure will be 100x150 ft.

Los Angeles, Calif.—The Pittsburgh Foundry Co., East 32d St., has acquired a site on Alameda St., and will erect a brick foundry. The cost is estimated at $15,000.

Sacramento, Calif.—Local press reports state that the California Almond Growers' Exchange will build an almond shelling factory. T. C. Tucker is Mgr.

Montreal, Que.—The Tuckett Tobacco Co., Ltd., 379 Craig St., is receiving bids for a $100,000 factory. Stewart & Witton, 7 Hughson St., Hamilton, Ont., and Brown & Vallance, Southern Bldg., Montreal, Que., are the Archs.

Montreal, Que.—The Farmers Supply Co., Bannatyne Ave., will build a four-story warehouse, to be built on Curtis St. The cost will be $45,000.

Toronto, Ont.—S. Rosenblat will build a $35,000 warehouse at 19 McCaul St.

Winnipeg, Man.—The Oribo Mfg. Co., 233 Spadina Ave., plans a $15,000 factory.

FEDERAL GOVERNMENT WORK

Oil Engine Machinery—Boston, Mass.—Bids will be received until 2 p.m., July 7, by the Light House Inspector, for repairs and installation of oil engine machinery, etc., on light vessel No. 54.

Post Office—Burlington, N. J.—Bids were received as follows, June 17, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of a post office at Burlington, (a) limestone; (b) sandstone: Hedden Construction Co., New York, (a) $39,176, (b) same; F. W. Van Loan, Philadelphia, Penn., (a) $39,970, (b) $40.300; Edward F. Fonder, Philadelphia, Penn., (a) $42,393, (b) $43,393; William H. Egan, New York, (a) $39.872, (b) $40,291; J. S. Rogers Co., Moorestown, N. J., (a) $36,999, (b) $37,199; William H. Fissell, New York, (a) $43,000, (b) $43,500; Westchester Engineering Co., White Plains, N. Y., (a) $42,106, (b) $43,000; Berry-Goodwin Co., Philadelphia, Penn., (a) $44,880, (b) $44,930; Olin Gerlach, Frostburg, Md., (a) $40,759 (b) $41,100; Joseph di Benedetto, New York, (a) $39,970, (b) same; E. F. Abbott Construction Co., New York, (a) $39,500, (b) $40,300; Wilbert B. Titus, Falesboro, N. J., (a) $39,000, (b) $39,000, (b) $39,500; Charles McCaul Co., Philadelphia Penn., (a) $38,969, (b) $39,369. Noted May 21.

+Dredging—New Jersey—Contracts for dredging have been awarded as follows: JOHN & JOSEPH MCSPIRIT, 118 Wayne St., Jersey City, N. J., at $12,000, for dredging Keyport

Harbor; JOHN GERRISH, 101 Tremont St., Boston, Mass., $9000, for dredging Raritan River Bids received for South River, Shoal Harbor and Compton Creek, have been rejected. Noted June 18.

✚Dredging—Woodbury Creek, N. J.—The contract for dredging Woodbury Creek, has been awarded to the AMERICAN DREDGING CO., Philadelphia, Penn., at $34,500. Noted June 18.

✚Dredging—Philadelphia, Penn.—The contract for dredging in entrance channel and basin at Erie Harbor, has been awarded to JOHN H. DREYMANN, Toledo, Ohio at $8944.

✚Refrigerating Apparatus—Washington Barracks, D. C.—The contract for furnishing refrigerating apparatus at Washington Barracks, has been awarded to the H. W. JOHNS MANVILLE CO., New York, at $8696. Noted June 4.

Post Office—Gastonia, N. C.—Bids were received as follows, June 16, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of a post office at Gastonia, (a) limestone; (b) sandstone:

M. L. Hollyday, Greensboro, N. C., (a) $52,706; (b) $53,000. Barnes Bros., Logansport, Ind., (a) $65,000. J. S. Rogers Co., Moorestown, N. J., (a) $54,000; (b) $56,000. Newport Contracting & Engineering Co., Newport News, Va., (a) $61,410; (b) $63,410. Daniel T. McCarthy, Philadelphia, Penn., (a) $58,827; (b) $62,677. J. H. Brent, Construction Co., Norfolk, Va., (a) $50,679; (b) $51,829. Algernon Blair, Montgomery, Ala., (a) $61,414; (b) $63,000. William H. Fissell, New York, (a) $54,890; (b) $56,646. Noted May 14.

Repairs to Vessel—Charleston, S. C.—Bids will be received until 2 p.m., July 6, by the Light House Inspector, Charleston, S. C., for repairing light house tender "Mangrove."

✚Lift and Pumping Plant—Montgomery, Ala.—The contract for the installation of the hydraulic lift and pumping plant in the U. S. post office at Montgomery, has been awarded to ALGERNON BLAIR, Montgomery, Ala., at $7468. Noted Apr. 30.

Post Office—Grenada, Miss.—Bids were received as follows, June 16, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of a post office at Grenada, Miss., (a) limestone; (b) sandstone: Barnes Bros., Logansport, Ind., (a) $42,000. Newport Contracting & Engineering Co., Newport News, Va., (a) $41,000; (b) $41,500. C. H. Dobbs, Meridian, Miss., (a) $41,825; (b) $42,425. Algernon Blair, Montgomery, Ala., (a) $40,318; (b) $41,000. Two story and basement building, 3800 sq.ft. ground area, construction, nonfireproof, stone and brick facing, composition and slate roof. Noted May 14.

Building—New Orleans, La.—The only bid received June 20, by the Chief of the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for the construction of a Radio Building at the Naval Station, New Orleans, La., was submitted by Henry Monk, Pensacola, Fla., $5780. Noted June 18.

★Towboat—New Orleans, La.—All bids have been rejected by Capt. C. O. Sherril, Corps Engrs., U. S. A., for constructing the steel towboat "Chalmette." Work will be readvertised. Noted June 11.

✚Levee—New Orleans, La.—The contract for about 100,000 cu.yd. of earth work for levee in the Atchafalaya Levee district, has been awarded to the THORNTON CONSTRUCTION CO., McDonoughville, La., at $24,870.

Towboat—New Orleans, La.—All bids received June 2, by Capt. C. O. Sherrill, Corps Engrs., U. S. A., for towboat "Chalmette," have been rejected as excessive. Noted June 11.

★Post Office—Cookeville, Tenn.—Bids will be received until 3 p.m., July 30, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., for the construction complete of the U. S. post office and court house at Cookeville, Tenn. It will be three story and basement building, ground area, 5000 sq.ft., first floor fireproof; stone, ornamental terra cotta and brick facing.

Post Office—Covington, Tenn.—Bids were received June 13, by Oscar Wenderoth, Superv. Arch., Treas. Dept., Washington, D. C., for the construction of a post office at Covington, as follows: (a) limestone; (b) sandstone: Algernon Blair, Montgomery, Ala., (a) $39,771; (b) $40,000. Northern Construction Co., Milwaukee, Wis., (a) $41,498, (b) $41,898. Crawford-Williamson Construction Co., Memphis, Tenn., (a) $42,945; (b) $43,401. Christ Kanzler & Son, Evansville, Ind., (a) $45,762; (b) $46,000. It will be a two-story and basement building, 3800 sq.ft., ground area, stone and brick facing, non-fireproof construction, composition and slate roof. Noted May 14.

Post Office—Jackson, Ky.—Bids were received as follows, June 17, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of a post office at Jackson, Ky., (a) limestone; (b) sandstone: J. S. Rogers Co., Moorestown, N. J., (a) $70,800; (b) $71,000. William H. Fissell, New York, (a) $77,300; (b) $77,800. Newport Contracting & Engineering Co., Newport News, Va., (a) $87,698; (b) $88,189. M. Yeager & Sons, Danville, Ill., (a) $83,656; (b) $84,256. Christ Kanzler & Co., Evansville, Ind., (a) $70,600; (b) $71,600. Westchester Engineering Co., White Plains, N. Y., (a) $79,399; (b) $81,000. M. L. Hollyday, Greensboro, N. C., (a) $74,338; (b) $78,000. Building to be three story and basement, 5000 sq.ft. ground area, first floor fireproof, stone, ornamental terra cotta and brick facing, composition and slate roof. Noted May 14.

Steel Barges—Cincinnati, Ohio—Bids were received June 12, by Lt. Col. H. Jervey, Corps Engrs., U. S. A., for constructing three steel deck barges as follows: A, two steel barges delivered at Marietta, Ohio; B, one steel barge delivered at Cattlettsburg, Ky.; or C, three steel barges delivered at shipyard. Chas. Hegewald Co., New Albany, Ind., A $3699 each, B $3699, C $3599 each (recommended for award); Pittsburgh Des Moines Steel Co., Pittsburgh, Penn., A $4120 each, B $4200, C $3620 each; American Bridge Co., of New York, Cincinnati, Ohio, A $3700, alternate $4400 each, B $3800 and $4500 each; C $3635 and $4335 each. Noted May 28.

Breakwater—Cleveland, Ohio—Bids were received, June 19, by Lt.-Col. Charles S. Bromwell, Corps Engrs., U. S. A., for completing east breakwater extension, Cleveland Harbor, from the Edward Gillen Dock, Dredge & Construction Co., Racine, Wis., $148,441; Great Lakes Dredge & Dock Co., $182,520. Noted June 11.

Erecting Storehouse—Cleveland, Ohio—Bids were received June 15, by Lt. Col. Chas. S. Bromwell, Corps Engrs., U. S. A., for erecting storehouse at foot of East Ninth St., Cleveland, Ohio, as follows: Andrews Bros., 130 B. of L. E. Bldg., Cleveland, Ohio, at $10,877 (recommended for acceptance). The C. N. Griffin Co., $12,676, Hunkin-Conkey Construction Co., $13,715. The Bolton Pratt Co., $14,262. Philip Kirschner, $13,558. Noted May 28.

Post Office—Gary, Ind.—Bids will be received until 3 p.m., Aug. 6, by Oscar Wenderoth, Superv. Arch., Treas. Dept., Washington, D. C., for the construction of the U. S. post office at Gary, Ind. It will be a two-story and basement building, ground area, 7190 sq.ft.; stone facing composition roof.

Post Office—Three Rivers, Mich.—Bids will be received until 3 p.m., Aug. 2, by Oscar Wenderoth, Superv. Arch., Treas. Dept., Washington, D. C., for the construction complete of a two-story and basement stone and brick faced U. S. post office of 4000 sq.ft. ground area, fireproof first floor, at Three Rivers.

Post Office—Macomb, Ill.—Bids were received June 15, by Oscar Wenderoth, Superv. Arch., Treas. Dept., Washington, D. C., for the construction of a post office at Macomb as follows: (a) limestone; (b) sandstone: Hiram Lloyd Building & Construction Co., St. Louis, Mo., (a) $61,722; (b) $64,722. R. S. Moore, Lafayette, Ind., (a) $56,780; (b) $61,140. N. H. Shields, Danville, Ill., (a) $59,970. Barnes Bros., Logansport, Ind., (a) $62,000. P. H. Tiernan, Macomb, Ill., (a) $63,700; (b) $64,900. J. L. Crouse, Greensboro, N. C., (a) $56,842; (b) $58,842. Northern Construction Co., Milwaukee, Wis., (a) $56,984; (b) $60,000. Christ Kanzler & Son, Evansville, Ill., (a) $59,985; (b) $61,485. It will be two-story and basement building, stone and brick facing, partly fire-proof construction, composition, slate and tin roof, 4200 sq.ft. ground area. Noted May 14.

★Excavating Machinery—St. Paul, Minn.—Bids will be received until 2 p.m., Aug. 6, by Lt.-Col. Chas. L. Potter, Corps Engrs, U. S. A., for furnishing excavating machinery of the drag line type fitted with orange peel bucket, for dredge "Manitou."

★Lock Gate Operating Machinery, Etc.—St. Paul, Minn.—Bids will be received until 2 p.m., July 27, by Lt. Col. Chas. L. Potter, Corps Engrs, U. S. A., for lock gate operating machinery, valves, operating stands, and accessories.

Post Office—Garden City, Kan.—Bids will be received until 3 p.m., July 20, by Oscar Wenderoth, Superv. Arch., Treas. Dept., Washington, D. C., for the construction complete of the U. S. post office at Garden City, Kan. It will be one-story and basement, ground area 3800 sq.ft.; first floor fireproof.

Post Office—McPherson, Kan.—Bids were received, June 15, by Oscar Wenderoth, Super. Arch., Treas. Dept., Washington, D. C., for the construction of a post-office at McPherson, (a) limestone; (b) sandstone: Nicholas Miller, Kansas City, Mo., (a) $44,400; (b) $44,500. Dieter-Wenzel Construction Co., Wichita, Kan., (a) $48,466; (b) $48,766. George A. Shaul, Seneca, Kan., (a) $46,663. Hiram Lloyd Building & Construction Co., St. Louis, Mo., (a) $43,366; (b) $43,566. Heman Construction Co., St. Louis, Mo., (a) $44,750. Frank H. Latimer & Son, Kansas City, Mo., (a) $45,519. It will be a two-story and basement building, 3800 sq.ft., ground area, nonfireproof construction, stone and brick facing, composition and slate roof. Noted May 14.

Elevator—Wichita, Kan.—Bids were received by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., for removal of present elevator and installing, a new hoistway, electric passenger elevator and hydraulic lift in the U. S. Court house at Wichita, Kan., from Kaestner & Hecht Co., Chicago, Ill., $8200, Otis Elevator Co., Washington, D. C., $11,074.

Lavatory—Cheyenne, S. D.—Bids were received for constructing a lavatory annex to dormitory at the Cheyenne and Arapaho Indian School, Okla., as follows: W. D. Lovell, Minneapolis, Minn., $5900, George Clark & Son, Enid, Okla., $4764, Spencer J. Wick, El Reno, Okla., $5534, Billings & Fielding, Guthrie, Okla., $7970.

★Highway Bridge—Jackson, Wyo.—Bids will be received until 2 p.m., July 22, by F. H. Newell, Dir., U. S. Reclamation Service, Boise, for constructing a highway bridge, consisting of three 130-ft. steel truss spans and wooden trestle approaches, across the south fork of the Snake River, near Jackson, Wyo.

★Earthwork and Structures—Malta, Mont.—Bids were received, June 10, by Charles P. Williams, Acting Superv. Engr., Great Falls, for earthwork and structures, Dodson South Canal, as follows: A, Schedule 1; B, Schedule 2; C, Schedule 3; D, total. The Security Bridge Co., Minneapolis, Minn., C, $48,935; Temple & Siroky, Malta, Mont., A, $4548; B, $11,190; D, $15,738; Tebbs, Taggert, Jurgens & Knipe, Glasgow, Mont., A, $4594; B, $11,709; D, $16,303; Heuser & Sim, Malta, Mont., A, $4712; B, $11,937; C, $49,700; D, $66,349; C. F. O'Neill, Chateau, Mont., A, $4784; B, $12,119; D, $16,903; Snelson Bros., Glasgow, Mont., A, $4850; James O'Conner, 231 Park Ave., Council Bluffs, Iowa, A, $4895; B, $12,395; D, $17,290; Dooling Bros., Tampico, Mont., A, $4904; B, $12,514; D, $17,418; Querry & Davis, Malta, Mont., A, $4939; B, $12,549; D, $17,488; Charles Wilhite & Co., Malta, Mont., A, $5169; B, $13,109; D, $18,278; A. L. Markhus, Polson, Mont., A, $6620; B, $18,550; C, $73,048; D, $98,249. Noted May 7.

★Steel Pipes—Milk River, Mont.—Bids will be received until 2 p.m., July 22, by F. H. Newell, Dir., U. S. Reclamation Service, Los Angeles, Calif., for furnishing material and erecting riveted steel pipes for the Milk River project, Montana.

✚Barracks and Stable—Fort Sam Houston, Tex.—The contract for constructing barracks and a stable about four miles from San Antonio, has been awarded to M. S. WRIGHT, San Antonio, Tex., at $413 for barrack building and $2939, for stable.

Elevator—Guthrie, Okla.—Bids will be received until 3 p.m., July 10, by Oscar Wenderoth, Superv. Arch., Treas. Dept., Washington, D. C., for the installation complete of an electric passenger elevator, and a hydraulic lift, etc., in the U. S. post office and court house at Guthrie.

Water Tube Boilers, Etc.—Las Animas, Colo.—Bids will be received until 11 a.m., July 11, by H. R. Stanford, Chief, Bureau of Yards and Docks, Navy Dept., Washington, D. C., for furnishing and installing four 100-hp. water tube boilers, a fan and motor, valves, piping, and all other accessories in the central power plant, U. S. Naval Hospital, Las Animas, Colo.

✚Building—Santa Fé, N. M.—The contract for constructing an addition to the dormitory at the Santa Fé Indian School, has been awarded to J. A. HARLAN & SON, Albuquerque, N. M., at $16,228. Noted Apr. 23.

✚Cement—Minidoka, Idaho—Contracts have been awarded to the OGDEN PORTLAND CEMENT CO., and the UNION PORTLAND CEMENT CO., Devil's Slide, Utah, for 5500 bbl. of cement from each company, for use on the Jackson Lake Dam, Minidoka irrigation project, Idaho, at $1.33 per bbl. f.o.b. factory.

★Steel Highway Bridge—Yuma, Ariz.—Bids were received June 15, by the Comr. of Indian Affairs, Washington, D. C., for constructing a steel highway bridge across the Colorado River, at Yuma, Ariz., as follows: A for all steel in superstructure, except steel in curbs and reinforcing steel in road and foot walks, erected and painted, B for reinforced concrete roadway, foot walks, and curbs, C plank road way and foot walks, with timber guard rail and furring for stringers, D concrete abutments and piers, E grading approaches, F unit price for addition or omission of concrete in abutments and pier to be added to or deducted from item D. Omaha Structural Steel Works, Omaha, Neb., A, $77,000, B, $51,316, C, $9437, D, $4041, E, $168, F, $14 per cn.yd. The Clinton Bridge Works, Clinton, Iowa, A, $56,700; The Midland Bridge Co., Kansas City, Mo., A, $50,180, B, $9437, C, $4250, D, $20,180, E, $150, F, $15 per cu.yd.; Penn Bridge Co., Beaver Falls, Penn., A, $52,380, B, $9591, C, $3750, D, $16,427, E, $500, F, $9 per cu.yd.; The Snare & Triest Co., New York, A, $52,265, B, $9740, C, $5085, D, $21,000, E, $400, F, $9 per cu.yd.; The Missouri Valley Bridge & Iron Co., Leavenworth, Kan., A, $38,466, B $9008, C, $5789, D, $17,387, E, $231, F, $13 per cu.yd. Noted Apr. 30.

Elevator—Astoria, Ore.—The Otis Elevator Co., Washington, D. C., submitted a bid at $5072, for hydraulic lift, pumping plant, etc., in the U. S. post office at Astoria, Ore.

✚Diversion Channel—Klamath Falls, Ore.—The Secretary of the Interior has awarded the contract for constructing the Lost River diversion channel of the Klamath irrigation project to W. E. Mason, of Klamath Falls, Ore., at $19,922.

✚Railroad—Fort Mason, Calif.—The contract for constructing the railway at Fort Mason, has been awarded to the CONTRA COSTA CONSTRUCTION CO., Berkeley, Calif., at $27,892. Noted June 4.

✚Water System—Fort Scott, Calif.—The contract for installing the water system at Fort Winfield Scott, has been awarded to R. C. GORRILL, at $4230.

Excavation—Montrose, Calif.—Bids will be received until 4 p.m., July 6, by the U. S. Reclamation Service, Montrose, Calif., for constructing about 3.4 miles of the Selig canal, and 3.5 miles of the Upper Selig extension canal of the Selig canal system, Uncompahgre Valley, project, in the vicinity of Montrose, Calif. The work involves the excavation of about 145,000 cu.yd. of material.

Cast-Iron Water Pipe, Valves, Etc.—Panama—Bids will be received until 10:30 a.m., July 6, by Maj. F. C. Boggs, Gen. Pur. Officer, Isthmian Canal Comn., for furnishing cast-iron water pipe and fittings, valves, steel rail, angle bars, frogs, etc., at Panama.

Buildings—Hawaii—Bids will be received until 11 a.m., Aug. 15, by H. R. Stanford, Chief, Bureau of Yards and Docks, Washington, D. C., for erecting five industrial buildings at the U. S. Naval station, Pearl Harbor, Hawaii.

MISCELLANEOUS

Dredging, Seawall Breakwater—Boston, Mass.—The following bids were opened by the State Harbor and Land Commission for dredging at Duxbury Bay for an exchange basin: John R. Burke, Boston, 35¼c. per cu.yd. for earth and $10 for rock; Eastern Dredging Co., Boston, 34½c. and $10; J. S. Packard Dredging Co., Providence, R. I., 32.9c. and $9; for sea wall at Falmouth Heights: Wm. H. Ellis, Boston, $11.44; John Cashman & Sons Co., Quincy, $10.70; Morley Flathey Co., Manchester, Mass., $10.50 or $6510 lump bid; Frank C. Taylor, New Bedford, $9.90; R. L. Whipple & Co., Worcester, $9.79; Edward E. Pierce, Falmouth, $8.95; Randle & Stoddard, Boston, $8.70; D. M. Briggs & Co., Boston, $7.98; Howard Swift, E. Falmouth, $7.85; Wm. Sears & Jos. H. Connolly, $7.40; Dennis F. Crowley, E. Milton, $7.40; W. H. Conner, Middleboro, $6.75; for breakwater at Dartmouth, at Salters Point: Daniel J. Boylon, New York, $2.75 and $2.22 and $11; John Cashman & Sons Co., Quincy, $2.70 and $15; Wm. H. Ellis, Boston, $2.64 and $2.64; Dennis F. Crowley, E. Milton, $2.30 and $18; John R. Burke, Boston, $2.10 and $4.95; Jos. C. Terry, Fall River, $1.69 and $4.30; E. S. Belden & Sons, Hartford, Conn., $1.47 and $10; Wm. F. Williams, State House, Boston, is Ch. Engr.

★✚Drydock, Pier—Boston, Mass.—(Official)—The Directors of the Port of Boston, June 22, awarded the contract for building the new dry-dock at South Boston, the whole interior to be lined with granite, to the HOLBROOK, CABOT & ROLLINS CORPORATION, 331 Madison Ave., New York, the lowest bidder, at $1,846,582, and the contract for Commonwealth Pier 1 at East Boston to WOODBURY & LEIGHTON the lowest bidder at $658,857. Woodbury & Leighton's bid is for the pier completed. Bids were opened June 15 for the dry dock and June 16 for the pier. The bid of Winston & Co. for the dry dock was erroneously noted last week as $1,095,937. The company bid $1,895,937.

Gymnasium—Worcester, Mass.—The trustees of the Worcester Acadamy, voted June 12, to build a $75,000 gymnasium during the year.

Dike—Binghamton, N. Y.—The lowest bid submitted to the city for constructing the Front St. Dike was that of H. W. Fitzgerald, Buffalo, N. Y., at $60,000. Bids were opened June 10.

Channel Work—East Hampton (L. I.), N. Y.—W. V. Watson, State Division Engr., East Hampton, is making surveys for deepening and widening Three Mile Harbor from Gardiner's Bay into the harbor. The State Legislature has appropriated $10,000 for the work.

Dam—Minisink, N. Y.—The State Conservation Commission, Albany, has approved plans and specifications for a dam at the outlet of Dechenhurst Pond, a branch of Rutgers Kill in the town of Minisink.

✚★Subways—New York, N. Y.—(Borough of Manhattan)—The Public Service Commission has awarded the contract to the RAPID TRANSIT SUBWAY CONSTRUCTION CO., 165 Broadway, New York, for constructing Sect. 7, of Route 5, a part of the Seventh Ave.-Lexington Ave. rapid transit railroad at $1,915,164. Bids were opened June 12. Lowest bidder noted June 18.

✚★Subway—New York, N. Y.—(Borough of Manhattan)—The contract has been awarded by the Public Service Commission to the RAPID TRANSIT SUBWAY CONSTRUCTION CO., 165 Broadway, New York, for constructing Sect. 1-A of Routes 4 and 38, a part of the Seventh Ave.-Lexington Ave. rapid transit railroad. Bids were opened June 9. Noted June 11.

Athletic Field—New York, N. Y.—Bids will be received until June 26 by the Board of Trustees of the College of the City of New York, for constructing an athletic field. Arnold W. Brunner, 101 Park Ave., New York, is Arch.

Fire Apparatus—Jersey City, N. J.—The city is considering the purchase of 25 pieces of automobile fire apparatus. Charles A. Van Kueren is City Engr.

Fire Escapes—Newark, N. J.—The Board of Chosen Freeholders will ask for bids at once for 250 automatic fire-escapes to be used on different county buildings.

Elimination of Grade Crossings—Philadelphia, Penn.—The Public Service Commission, Harrisburg, Penn., has approved plans for the elimination of grade crossings in South Philadelphia. Work will probably start soon at Oregon Ave., Delaware Ave., and Southern Boulevard. George Webster is Ch. Bureau of Surveys.

★Piers—Philadelphia, Penn.—(Official)—Bids will be received until noon, July 20, by George W. Norris, Dir. Dept. Wharves, Docks and Ferries, for constructing the superstructures of Piers 38 and 40 in the Delaware River between Catherine and Christian Sts.

Playgrund Work—Philadelphia, Penn.—The Wayne Iron Works, Commercial Trust Bldg., Philadelphia, submitted the lowest bid, June 1, to the Board of Recreation for work at Kingessing Playground, at $14,541. The work calls for brick and stone posts, concrete and cement coping, iron fences, etc.

Dredging—Baltimore, Md.—The city is considering dredging the harbor to improve its port facilities. Estimated cost, $250,000. H. K. McKay is City Engr.

✚Ditches—Cleveland, Miss.—The contract has been awarded by the Drainage Commissioners of Bolivar County for 12.6 miles of drainage ditches in Deeson Rrainage District. The contract has been awarded to the KISSNER CONSTRUCTION CO., Coshocton, Ohio, at 9.36c. per cu.yd. The work calls for 320,630 cu.yd. This item was noted erroneously, June 11 under Dermott, Ark.

Levee—New Orleans, La.—The State Board of Engineers opened bids June 18 for 53,000 ft. of the Fairfield Levee and 28,000 ft. of enlargement of Gouldsboro Levee. W. M. Rushing was lowest bidder on the first at 18.40c. a cu.yd. and the Texas & Pacific R.R. the lowest on the second, at 36½c.

Conduits—New Orleans, La.—Bids were opened June 17 by the Sewage and Water Board for concrete work and for constructing underground conduits. The low bidders were Theodore O. Hotard at $101,000 for concrete work, and W. J. Kane, $247,000 for underground conduits.

Drainage Canal—Jackson, Tenn.—Bids will be received until June 30, by Judge A. B. Stovall, Jackson, for constructing a drainage canal. The work calls for about 46,355 cu.yd. of excavation and 20 acres of clearing. Y. M. Patterson, Jackson, is Engr.

Dredging—Canton, Ohio—Bids are being asked by the city for dredging West Creek. Estimated cost, $11,000. William E. Sarver is City Engr.

Gymnasium—Cleveland, Ohio—Plans have been prepared by Hubbell & Benes, Archs., Citizens Bldg., Cleveland, for a one-story and basement gymnasium 36x75 ft. to cost $40,000, for the Hathaway-Brown Institution, 1945 East 97th, St., Cleveland.

✚Dredging—Urbana, Ohio—The county has awarded the contract to CHAPMAN BROS., Celina, Ohio, for dredging 13 miles of the Mad River, at $34,975.

✚Wall—Elkhart, Ind.—The ELKHART BRIDGE & IRON WORKS, Elkhart, has been awarded the contract by the city for a reinforced concrete retaining wall, at about $10,000.

Dock—Michigan City, Ind.—Bids will be received until 2 p.m., June 30, by the Board of Public Works for constructing a municipal dock. Alexander Spysholski is City Clk.

Drainage Pumps, Etc.—Carrollton, Ill.—Bids will be received until July 2 by Hartwell Drainage and Levee District, Carrollton, for three centrifugal pumps, electrically driven. Alternate bids will be received on steam and oil-pull engines. The Caldwell Engineering Co., Jacksonville, Ill., is Engr.

Drainage—Kankakee, Ill.—Bids will be received until 2 p.m., July 1, by the Commissioners of Little Beaver Special Drainage District at the office of the County Clerk, Kankakee, for drainage work.

✚Levee Work—Oquawka, Ill.—(Official)—The Commissioners of Henderson County Drainage District No. 3 awarded the contract, June 11, to R. H. & G. A. McWILLIAMS, Steger Bldg., Chicago, Ill., for 300,000 cu.yd. of levee work, at $42,500.

Barns—Springfield, Ill.—Bids will be received until 3 p.m., June 29, by the Board of Administration, Springfield, for constructing three dairy barns at Anna State, Hospital, Anna, Ill.; Lincoln State School and Colony, Lincoln, Ill., and State Training School for Girls, Geneva, Ill. F. D. Whipp is Fiscal Superv.

Elimination of Grade Crossings—Springfield, Ill.—The city plans to construct a subway at South Sixth St., to eliminate the grade crossing of the Wabash R.R. at that point. Wade D. Seely is City Engr.

✚Drains—Algona, Iowa—The County Supervisors have awarded contracts for drains as follows: Drain 82, to F. MARSH & CO., $135,000; open work, to I. O. FLORENCE, Thompson, at $42,000; Drain 83, open work, to INTERSTATE DRAIN & INVESTMENT CO., $9000; tile work on Sub. 4 of Drain 60, to CEMENT PRODUCT CO., Spencer, at $2080; tile work on Drain 102, to WELP CEMENT PRODUCT CO., Bancroft, $15,453, to JOHN NOSTROM, Algona, Sub. 3 of Drain 3 at $5335, and SHINN & BUSH, on Drain 98, at $6100.

✚Drain—Webster City, Iowa—The County Commissioners have awarded the contract to J. D. DUNKEL, Webster City, for constructing Drain No. 3, at $49,995.

CONTRACT PRICE

Rapid Transit System—New York—Bids were received by the Public Service Commission, June 16, for Section 1, Route 12, Rapid Transit System. This includes a four-track subway from the terminus of the present subway at Atlantic Ave., Brooklyn, through Flatbush Ave. to a point near St. Marks Place and a two-track subway spur connecting the Fourth Ave. line with the Brighton Beach line. The bidders were (A) Crawford Co., 177 Montague St., Brooklyn, N. Y.; (B) Degnon Contracting Co., 60 Wall St.; (C) E. C. Moore; (D) E. E. Smith Contracting Co., 101 Park Ave.; (E) Litchfield Construction Co., 23 Flatbush Ave., Brooklyn; (F) Rapid Transit Subway Construction Co., 165 Broadway; (G) Oscar Daniels Co., Woolworth Bldg.; (H) Smith Hauser & MacIsaac, Inc., New York; (I) P. J. Carlin Construction Co., 1123 Broadway; (J) Underpinning & Foundation Co., 290 Broadway. The item bids were as follows:

Ditch—Bemidji, Minn.—The county will construct Ditch No. 13 at a cost of $92,466. J. L. George, Bemidji, is County Audr.

Ditch—Bemidji, Minn.—Bids will be received until 10 a.m. June 26, by the County Auditors of Beltrami and Marshall Counties, Bemidji, for constructing Ditch 21. The work calls for 2,297,171 cu.yd. of excavation. Estimated cost, $309,920.

Ditch—Bemidji, Minn.—Bids will be received until June 26 by the auditors of Beltrami and Marshall Counties, at Bemidji, for constructing Ditch 21. Estimated cost, $309,920.

✚Ditch—Fairmont, Minn.—The County Commissioners, Fairmont, have awarded the contract to the CEMENT PRODUCTS CO., Estherville, Iowa, for constructing Ditch 37, at $20,789.

Ditch—Shakopee, Minn.—Bids will be received until 11 a.m., July 14, by A. J. Mayer, County Audr., Shakopee, for constructing Ditch No. 4. The work calls for 103,304 cu.yd. of excavation. Estimated cost, $10,336.

Drainage—Falls City, Neb.—J. F. Reif, Falls City, is making surveys for further improvements in Drainage District No. 1 of Richardson County.

✚Oil Tanks—Arkansas City, Ark.—The Standard Oil Co. has awarded the contract to the SOUTHERN BOILER & TANK WORKS, Memphis, Tenn., for constructing six large oil storage tanks at Bridge Junction and Arkansas City, Ark., at about $30,000.

✚Ditches—Dermott, Ark.—(Official)—The Commissioners of Dermott Drainage District have awarded the contract to R. H. & G. A. McWILLIAMS, Steger Bldg., for 47 miles of open ditches, calling for 1,800,000 cu.yd. of excavation, at 8.40 and 9.50c. per cu.yd. The contractors also purchased the bonds of the district at par. Erroneously noted June 11 as awarded to the Kissner Construction Co.

Drainage—Texarkana, Ark.—Plans have been filed, it is reported, by Nix Creek Drainage District, Texarkana, for its proposed drainage system. Estimated cost, $36,500. Noted June 18.

RAPID TRANSIT SYSTEM, NEW YORK, N. Y., SECTION I., ROUTE 12

	A	B	C	D	E	F	G	H	I	J
261,300 cu.yd. earth excavation above mean h.w.	$3.07	$3.00	$3.40	$3.00	$3.85	$3.25	$3.50	$3.40	$3.65	$3.60
13,900 cu.yd. earth excavation below mean h.w.	3.50	3.50	3.40	4.00	3.85	3.25	4.00	3.40	3.90	10.00
15,100 cu.yd. earth excavation for sewers and pipes	3.00	3.00	3.40	3.00	3.85	3.25	3.50	4.00	2.80	3.60
3860 lin.ft. underpinning buildings under seven stories	30.00	30.00	50.00	55.00	50.00	50.00	40.00	60.00	50.00	95.00
200 lin.ft. maintaining protecting and securing buildings	30.00	30.00	50.00	40.00	50.00	30.00	40.00	50.00	35.00	95.00
Maintaining etc. the Brooklyn Academy of Music	20,000.00	36,000.00	25,000.00	20,000.00	15,000.00	25,000.00	33,000.00	16,000.00	62,500.00	60,000.00
Maintaining etc. the Hanson Pl. M.E. Church	13,500.00	24,000.00	20,000.00	20,000.00	15,000.00	25,000.00	33,000.00	14,000.00	20,000.00	50,000.00
Maintaining etc. watering trough at St. Mark and 6th Ave.	1000.00	5000.00	200.00	1500.00	2000.00	1000.00	2000.00	2000.00	2000.00	3000.00
45,700 cu.yd. concrete masonry	7.00	8.00	7.50	9.00	7.50	8.00	9.00	7.50	8.00	9.00
4100 cu.yd. protective concrete masonry	6.00	8.00	7.50	7.00	7.50	7.00	9.00	7.50	8.50	9.00
50 cu.yd. rubble stone masonry	7.50	6.00	6.00	7.00	8.00	8.00	8.00	7.00	8.50	8.75
50 cu.yd. dry rubble masonry	6.00	5.00	6.00	5.00	6.00	7.00	5.00	7.00	7.00	8.50
20 cu.yd. brick masonry	15.00	15.00	12.00	15.00	20.00	15.00	20.00	20.00	20.00	20.00
5 cu.yd. vitrified brick masonry	15.00	18.00	15.00	20.00	20.00	40.00	25.00	30.00	25.00	20.00
520 cu.yd. removal and disposal of concrete bulkhead	15.00	7.00	10.00	10.00	7.00	10.00	9.00	20.00	15.00	25.00
40 cu.yd. hollow terra cotta brick or tile masonry	15.00	15.00	15.00	15.00	15.00	15.00	20.00	18.00	20.00	25.00
1000 bbl. grout of portland cement	3.00	2.50	2.50	2.50	4.00	2.50	2.00	3.00	3.00	2.50
1000 lin.ft. timber piles	0.50	0.50	0.30	0.50	0.40	0.75	0.40	1.00	0.40	1.00
2 M. ft. b.m. timber foundations	100.00	50.00	60.00	50.00	50.00	75.00	70.00	100.00	50.00	50.00
50 cu.yd. broken stone or gravel	3.00	2.25	2.00	3.00	2.00	2.50	3.00	3.00	2.00	3.00
11,200 sq.yd. waterproofing, 1-ply	0.60	0.50	0.60	0.50	0.30	0.50	0.40	0.40	0.30	0.50
100 sq.yd. waterproofing, 2-ply	1.00	0.75	1.00	0.80	0.50	0.75	0.70	0.70	0.50	0.90
26,600 sq.yd. waterproofing, 3-ply	1.00	1.10	1.10	1.10	0.70	1.00	1.00	1.00	1.00	1.30
100 sq.yd. waterproofing, 4-ply	1.50	1.35	1.50	1.40	0.90	1.25	1.30	1.25	1.30	1.70
100 sq.yd. waterproofing, 5-ply	1.75	1.65	1.75	1.70	1.10	1.50	1.60	1.50	1.60	2.10
100 sq.yd. waterproofing, 6-ply	2.00	2.00	2.00	2.10	1.30	1.75	1.90	2.00	1.90	2.50
100 sq.yd. waterproofing, dry ply	0.30	0.40	0.60	0.50	0.20	0.40	0.40	0.40	0.25	0.50
1730 cu.yd. brick laid in asphalt mastic	25.00	25.00	25.00	22.50	25.00	27.00	24.00	27.00	25.00	25.00
50 lin.ft. drain pipe, 12-in. vitrified	1.00	0.80	1.00	1.00	0.60	0.90	0.90	1.50	0.60	1.20
50 lin.ft. drain pipe, 10-in. vitrified	0.85	0.55	0.85	0.90	0.50	0.75	0.80	1.25	0.50	1.00
50 lin.ft. drain pipe, 8-in. vitrified	0.75	0.40	0.75	0.75	0.40	0.65	0.75	1.00	0.40	0.80
50 lin.ft. drain pipe, 6-in. vitrified	0.60	0.25	0.60	0.65	0.30	0.50	0.70	0.75	0.30	0.60
225 lin.ft. drain pipe, 4-in. vitrified	0.50	0.20	0.50	0.60	0.20	0.40	0.65	0.60	0.25	0.40
50 lin.ft. drain pipe, 6-in. c.i.	1.50	1.00	1.30	2.00	1.20	1.40	1.00	1.50	1.50	1.50
50 lin.ft. drain pipe, 4-in. c.i.	1.00	1.00	1.00	1.50	0.75	1.00	0.70	1.25	1.00	1.00
50 lin.ft. drain pipe, 10-in. c.i.	2.50	1.50	1.50	4.00	1.50	2.50	1.75	2.50	2.00	2.50
50 lin.ft. 3-in. c.i. pipes and fittings (extra heavy)	1.00	0.80	1.00	1.00	0.50	1.00	0.80	1.25	0.80	1.00
70 lin.ft. 4-in. c.i. pipes and fittings (extra heavy)	1.20	0.90	1.20	1.50	0.70	1.20	0.85	1.50	1.00	1.25
315 lin.ft. 6-in. c.i. pipes and fittings (extra heavy)	1.25	1.00	1.50	2.00	1.25	1.50	1.20	2.00	1.25	1.75
60 lin.ft. 8-in. c.i. pipes and fittings (extra heavy)	1.75	1.25	1.75	3.00	1.75	1.80	1.60	2.50	2.00	2.50
159,800 dt. ft. tunnel ducts	0.20	0.10	0.09	0.09	0.10	0.12	0.10	0.12	0.10	0.10
118,100 dt. ft. railroad ducts	0.10	0.15	0.10	0.15	0.10	0.15	0.13	0.15	0.10	0.20
3560 ton riveted steel	62.00	70.00	60.00	70.00	60.00	66.00	66.00	65.00	70.00	60.00
2870 tons beams and shapes	55.00	60.00	60.00	60.00	55.00	58.00	58.00	55.00	60.00	50.00
400 tons steel rods and bars	60.00	50.00	60.00	60.00	55.00	75.00	60.00	60.00	60.00	100.00
25 tons miscellaneous iron castings	75.00	70.00	60.00	75.00	50.00	60.00	60.00	100.00	50.00	100.00
5 tons miscellaneous iron furnishings	75.00	70.00	70.00	75.00	50.00	70.00	75.00	100.00	50.00	100.00
500 lb. special wire forms	0.10	0.10	0.10	0.25	0.03	0.10	0.20	0.10	0.10	0.20
3000 lin.ft. 1½-in. oak hand rail	0.60	1.00	0.35	0.50	1.00	0.60	0.20	0.20	0.75	0.50
8600 sq.ft. steel grating	1.00	1.50	1.50	1.50	1.40	1.50	1.75	1.50	1.50	1.60
3600 sq.ft. vault lights	1.50	1.50	1.30	1.50	1.25	1.50	1.35	1.50	1.50	1.25
6900 sq.yd. sidewalk restored	3.00	2.00	2.00	2.00	2.00	2.50	2.25	3.00	2.00	2.25
11,800 sq.yd. roadways restored asphalt	2.50	2.50	2.50	2.00	2.50	3.00	3.00	3.25	2.50	2.50
4150 sq.yd. roadways restored granite block	1.50	1.00	2.00	2.00	2.50	3.50	2.25	3.00	2.50	2.50
4500 sq.yd. roadways restored asphalt block	2.50	2.50	2.50	3.50	2.50	3.50	4.00	3.00	2.50	3.00
100 lin.ft. new bluestone curb	1.25	1.00	1.25	1.25	1.00	1.50	1.25	2.00	1.25	1.50
100 lin.ft. granite curb	1.50	1.50	2.50	2.50	2.00	2.00	1.50	3.00	1.50	2.50
5350 lin.ft. w.i. electric conduits, ¾-in.	0.20	0.40	0.20	0.30	0.20	0.25	0.12	0.20	0.20	0.40
900 lin.ft. w.i. electric conduits 1¼-in.	0.30	0.45	0.30	0.50	0.30	0.40	0.25	0.40	0.40	0.55
350 lin.ft. w.i. electric conduits, 2-in.	0.50	0.50	0.50	0.55	0.40	0.50	0.35	0.50	0.50	0.60
1600 lin.ft. w.i. electric conduits 1-in.	0.25	0.40	0.25	0.40	0.30	0.30	0.18	0.30	0.25	0.50
450 c.i. outlet boxes	1.00	1.00	1.00	1.50	0.50	1.00	1.00	1.50	1.00	1.25
300 lin.ft. 6-in. c.i. pipe and fittings	1.50	1.50	1.00	2.00	1.00	1.50	1.20	1.50	1.50	2.00
200 lin.ft. 3-in. c.i. pipe and fittings	1.00	1.00	0.75	1.00	0.75	1.00	0.85	1.25	1.00	1.00
1500 lin.ft. sewer-pipe, 12-in. vitrified	2.50	3.00	1.50	3.00	1.25	3.00	2.50	2.50	1.30	5.00
880 lin.ft. sewer-pipe, 15-in. vitrified	3.00	3.25	2.00	3.50	2.00	3.75	2.90	3.50	2.00	5.10
270 lin.ft. sewer-pipe, 18-in. vitrified	3.50	3.50	2.50	4.00	2.50	4.50	3.50	3.75	2.50	5.40
50 lin.ft. sewer-pipe, 20-in. vitrified	4.00	3.75	3.00	4.50	2.75	5.00	3.80	4.00	2.75	5.90
50 lin.ft. sewer-pipe, 22-in. vitrified	4.50	4.00	3.25	5.00	3.00	5.50	4.25	4.50	3.00	6.40

Excavation — Magnet City, Tex. — The Missouri-Lincoln Trust Co., Magnet City, is about to award contracts for 100,000 cu.yd. of machine excavation, near here and Lane City, Tex.

Drainage—Phœnix, Ariz.—The Buckeye Irrigation Co. will issue $35,000 in bonds for constructing a drainage system in Arizona. About 4000 acres in the lower Buckeye Valley, submerged by irrigation from the higher lands, will be drained by constructing a ditch to the Gila River, with diverging laterals to quarter sections to be reclaimed.

+Vessel—Raymond, Wash.—The Charles Nelson Steamship Co. has awarded the contract to ANDREW PETERSON, Raymond, for constructing a schooner.

+Rink—Seattle, Wash. — The MANHATTAN CO., Central Bldg., Seattle, has been awarded the contract for the construction of the two-story reinforced concrete ice-skating rink at 14th Ave and Jefferson St., to be built for Patrick Bros., Vancouver. The estimated cost is $150,000. The rink will require 10 miles of pipe for freezing ice.

Docks—Seattle, Wash.—Bids will be received until June 29 by the County Commissioners for constructing four docks at Vashon Island.

Ditch Work — Pateros, Wash.—The Lower Methow Ditch Co., Pateros, has been incorporated to construct a ditch to cost $12,000. W. G. Cooper, Paterson, is one of the incorporators.

Pier—Manhattan Beach, Calif.—(Manhattan post office) — The Manhattan Beach Pier & Beach Association plans to construct a municipal pier, 1000 ft. long. Estimated cost, $75,000.

+Canal—San Francisco, Calif.—EVERETT C. LINTHICUM, Fresno, Calif., has been awarded a contract at about $250,000 to construct a miniature of the Panama Canal at the Exposition Grounds, San Francisco.

Pier—San Francisco, Calif.—The Board of State Harbor Commissioners have approved plans for the construction of a pier at the foot of Kearney St. It will be a creosoted pile structure, 200 ft. wide, and 830 ft. long on the northerly side and 1060 ft. on the southerly. Jerome Newman, San Francisco, is Ch. Engr. Comrs.

Ferry Slips—San Francisco, Calif.—Bids are being received by the Harbor Commissioners for constructing Ferry Slips Nos. 9 and 10. Estimated cost, $100,000.

+Livestock Paddock—San Francisco, Calif.—The Panama-Pacific International Exposition Co. has awarded a contract for the construction of a livestock paddock on the exposition grounds to McSHEEHEY BROS., INC., at $63,300.

Fire-Alarm System and Fire Apparatus—Turlock, Calif.—Bonds for $15,000 have been voted for the installation of a fire alarm system and a motor-driven truck. Noted Apr. 23 and May 21.

Levee Work—Yuba, Calif.—Bids will be received until 10 a.m., June 27, by the Levee Directors of District No. 1 of Sutter County, Yuba, for levee repairs calling for 93,000 cu.yd. of material. E. T. Barrett is Clk.

Dredging—The Cadieux, Que.—Bids will be received until July 2 by R. C. Desrochers, Secy. Dept. Pub. Wks., Ottawa, Ont., for dredging required at Ile Cadieux.

+Fire Apparatus—Montreal, Que.—The city has awarded the contract to W. E. SEAGRAVE & CO., for fire apparatus, at $81,300.

Wall—Ottawa, Ont.—The Canadian Government plans to construct a retaining wall from Laurier Ave. to Mutchmor St. and from Bank St. Bridge to Dow's Lake, Ottawa. Estimated cost, $97,000.

Canal Work—Port Colborne, Ont.—Bids will be received until June 26 by R. C. Desrochers, Secy. Dept. Pub. Wks., Ottawa, Ont., for constructing stone protection work on the summit level, Welland Canal, between Thorold, Ont., and Port Colborne.

BUILDINGS

Boston, Mass.—The following bids were received June 9, by the Armory Commission for the construction of a cavalry armory at Brighton: J. J. Prendville, of Framingham, $397,500; Whiton & Haynes, Boston, $408,400; Woodbury & Leighton, Boston, $423,023; Norcross Bros., Worcester, $425,000; Geo. A. Fuller, New York, $433,987; Chas. S. Cunningham & Sons, Boston, $434,589; C. J. & J. M. Buckley, Boston, $437,654; Wells Construction Co., Chicago, Ill., $443,500; Chas. Logue, Boston, $453,720; Horton & Hemenway, Boston, $468,875; William Crane, Cambridge, $475,983; Connors Bros., Boston, $516,895; E. A. Peabody & Sons, Boston, $529,100. Noted May 28.

+The contract for the construction of the six-story mer-

RAPID TRANSIT SYSTEM, NEW YORK, N. Y., SECTION 1. ROUTE 12—Continued

	A	B	C	D	E	F	F	H	I	J
260 lin.ft. sewer-pipe, 24-in. vitrified	$5.50	$4.50	$3.50	5.50	$3.25	$6.00	$4.75	$5.50	$3.75	$6.90
120 tons sewer-pipe, c.i.	75.00	60.00	60.00	40.00	50.00	50.00	42.00	60.00	70.00	60.00
60 tons sewer-pipe c.i., special	75.00	80.00	70.00	80.00	75.00	75.00	72.00	100.00	70.00	120.00
50 lin.ft. brick or concrete sewer, 3 ft. 6 in. x 2 ft. 4 in.	7.50	9.00	6.00	7.50	3.75	8.00	5.50	7.50	4.00	9.00
670 lin.ft. brick or concrete sewer, 3 ft. 9 in. x 2 ft. 6 in.	8.00	10.00	7.00	9.00	3.87	9.00	6.50	10.00	4.25	9.00
360 lin.ft. brick or concrete sewer, 4 ft. 3 in. x 2 ft. 10 in.	9.50	12.00	9.00	10.00	5.40	10.00	8.25	12.00	5.50	9.50
40 lin.ft. sewer circular, 4 ft.	10.00	14.00	10.00	8.00	5.40	12.00	7.00	10.00	6.25	11.50
80 lin.ft. sewer circular, 5 ft.	12.00	16.00	12.00	10.00	7.00	14.00	9.00	16.00	7.50	12.50
640 lin.ft. sewer circular, 6 ft. 3 in.	15.00	17.50	17.00	12.00	8.50	17.00	10.00	14.00	9.00	14.00
235 lin.ft. sewer circular, 6 ft. 6 in.	15.00	18.00	18.00	14.00	9.00	18.00	14.00	15.00	10.00	11.50
30 lin.ft. sewer, 3 ft. 6 in. x 3 ft.	9.00	10.00	8.00	10.00	4.00	8.00	6.50	15.00	4.25	10.50
85 lin.ft. sewer, 3 ft. x 4 ft. 9 in.	14.00	14.00	12.00	15.00	4.00	12.00	7.50	15.00	6.25	10.50
70 lin.ft. sewer, 5 ft. 6 in. x 7 ft.	21.00	18.00	20.00	20.00	9.00	20.00	17.00	20.00	11.25	20.00
5400 lin.ft. electric (overhead trolley) railroad 6-in. track	7.00	5.00	4.00	3.00	1.00	5.00	4.00	5.00	10.00	5.00
Supporting elevated railroad columns										
31 partly on structure	500.00	600.00	500.00	900.00	675.00	700.00	600.00	900.00	1000.00	1725.00
4 partly on or partly off structure	500.00	750.00	500.00	1200.00	500.00	1000.00	600.00	1000.00	1000.00	1725.00
300 lin.ft. water pipe, 6-in.	0.75	1.00	0.80	0.75	0.75	1.00	1.25	1.00	1.00	0.90
100 lin.ft. water pipe, 8-in.	0.90	1.25	1.25	0.90	1.00	1.30	1.25	1.50	1.25	1.20
1730 lin.ft. water pipe, 12-in.	1.50	1.50	2.00	1.25	1.50	1.75	2.25	3.00	1.75	1.80
3600 lin.ft. water pipe, 16-in.	2.50	2.00	3.00	1.50	1.75	2.25	3.00	3.50	2.25	2.40
100 lin.ft. water pipr, 30-in.	5.00	3.00	4.00	3.00	4.00	4.50	4.50	5.00	6.75	4.50
100 lin.ft. water pipe, 36-in.	7.00	4.00	10.00	4.00	5.00	5.00	5.00	7.00	8.50	5.00
50 service connections for water pipes	25.00	25.00	15.00	15.00	8.00	20.00	15.00	20.00	10.00	25.00
400 lin.ft. gas-pipe, 4-in.	0.75	0.80	0.75	0.60	0.50	0.90	0.80	0.75	0.80	1.00
500 lin.ft. gas-pipe, 6-in.	1.00	1.00	1.00	0.75	0.75	1.00	1.10	0.75	1.00	1.00
100 lin.ft. gas-pipe, 8-in.	1.25	1.25	1.25	0.90	1.00	1.25	1.40	1.00	1.25	1.20
100 lin.ft. gas-pipe, 10-in.	1.50	1.35	1.40	1.20	1.00	1.50	1.65	1.20	1.75	1.50
100 lin.ft. gas-pipe, 12-in.	1.50	1.50	1.50	1.50	1.50	1.75	2.20	2.00	1.75	1.80
1000 lin.ft. by-passing pipe, 6-in.	3.00	3.50	3.50	3.50	3.50	5.00	3.50	4.00	2.50	5.00
1800 lin.ft. by-passing pipe, 8-in.	3.00	4.00	4.00	5.00	4.20	5.50	4.00	4.50	2.75	6.00
2700 lin.ft. by-passing pipe, 12-in.	4.00	5.00	4.80	8.00	5.00	6.50	5.50	5.00	5.00	7.00
2700 lin.ft. bypassing pipe, 14-in.	3.00	3.00	2.50	2.50	2.71	3.00	1.75	3.50	2.50	4.50
100 lin.ft. bypassing on trestle, 12-in.	5.00	5.00	4.80	15.00	5.00	7.00	5.50	7.00	7.50	7.00
100 lin.ft. bypassing pipe trestle	5.00	2.50	5.00	9.00	6.00	4.00	4.50	5.00	2.50	2.50
50 service connections for gas pipes all sizes	20.00	25.00	15.00	20.00	8.00	20.00	15.00	20.00	12.00	25.00
32 tons c.i. pipe (straight)	60.00	40.00	35.00	33.00	30.00	40.00	33.00	75.00	40.00	50.00
11 tons c.i. pipe (special)	75.00	70.00	60.00	75.00	50.00	75.00	65.00	100.00	70.00	100.00
100 lin.ft. high pressure fire system pipe, 8-in.	1.00	4.00	2.00	2.00	2.00	2.00	2.25	3.00	2.00	10.00
150 lin.ft. high pressure fire system pipe, 12-in.	2.00	5.00	3.25	3.00	3.00	3.00	3.30	4.00	3.00	15.00
260 lin.ft. high pressure fire system pipe, 20-in.	3.50	6.00	5.00	$5.00	4.00	4.00	5.50	6.00	5.00	25.00
5 tons c.i. spigot and groove pipe, straight	60.00	40.00	50.00	40.00	50.00	45.00	44.00	90.00	50.00	60.00
2 tons c.i. spigot and groove pipe, special	75.00	70.00	75.00	80.00	75.00	80.00	80.00	100.00	70.00	120.00
50,000 dt. ft. electric ducts and conduits	0.25	0.50	0.50	0.40	0.35	0.60	0.10	0.75	0.35	0.75
100 lin.ft. w.i. electric ducts and conduits, 2½-in.	0.50	0.75	0.50	0.50	0.40	0.60	0.20	0.50	0.50	1.00
1000 lin.ft. w.i. electric ducts and conduits, 3-in.	0.60	0.75	0.60	0.60	0.50	0.70	0.20	0.60	0.60	1.10
100 lin.ft. w.i. electric ducts and conduits, 3½-in.	0.70	0.75	0.70	0.70	0.65	0.80	0.20	0.80	0.70	1.20
100 lin.ft. w.i. electric ducts and conduits, 4-in.	0.80	0.75	0.80	0.80	9.75	0.90	0.20	1.00	0.80	1.30
100 lin.ft. w.i. electric ducts and conduits, 4½-in.	0.90	1.00	1.00	0.90	1.00	1.00	0.20	1.50	1.00	1.40
100 lin.ft. w.i. electric ducts and conduits, 2-in. Edison	0.50	1.25	0.50	1.25	0.50	0.50	0.20	0.50	0.60	1.60
100 lin.ft. w.i. electric ducts and conduits, 2½-in. Edison	0.60	1.25	0.60	1.50	0.50	0.60	0.20	0.70	0.60	1.70
100 lin.ft. w.i. electric ducts and conduits, 3-in. Edison	0.70	1.25	0.70	1.75	0.50	0.65	0.20	0.90	0.70	1.80
100 lin.ft. w.i. electric ducts and conduits, 1½-in. Edison	0.50	1.25	0.40	1.00	0.50	0.40	0.20	0.50	0.50	1.40
100 lin.ft. w.i. electric ducts and conduits, 1½-in. Edison	0.50	1.25	0.40	1.10	0.50	0.50	0.20	0.50	0.50	1.50
100 lin.ft. w.i. electric ducts and conduits, 2-in. Edison	0.50	1.25	0.40	0.50	0.50	0.50	0.20	0.50	1.00	0.90
50 service connections for electric ducts	32.00	30.00	10.00	25.00	8.00	20.00	15.00	25.00	25.00	30.00
4000 dt. ft. wooden electric ducts and conduifsto whatever kind	0.50	1.25	0.50	0.90	0.50	0.50	0.20	0.75	0.80	1.00
Totals	$2,195,296	$2,301,013	$2,390,671	$2,417,913	$2,440,675	$2,485,745	$1,487,938	$2,520,863	$2,581,523	$2,995,540

cantile building on Edinbow St., for Daniel C. Collins, has been awarded to the E. STODDARD & SONS CO., 85 Purchase St. Noted Apr. 2.

✚**Holyoke, Mass.**—The contract for the recitation building for Mt. Holyoke College, has been awarded to the CASPER RANGER CONSTRUCTION CO., Springfield, Mass. Putnam & Cox, 6 Hancock Ave., Boston, are the Archs.

Springfield, Mass.—Bids were received for the erection of the State Armory at Springfield, as follows: Daniel O'Connell's Sons, Holyoke, $78,000, Fred T. Ley & Co., Springfield, $80,000, Flynt Building Construction Co., $80,000, Casper Ranger Construction Co., Springfield, $81,875, Conners Bros., Boston, $87,637, W. A. Newton Co., $102,960. Gen. Howard Cox, Cambridge Trust Co., Cambridge, is Secy. of Armory Comn.

Providence, R. I.—J. F. O'Malley, Arch., 75 Westminster St., is preparing plans for the erection of a two-story and concrete store and office building, on Broad St., for the Broad Street Power Co. The estimated cost is $100,000.

✚**Bridgeport, Conn.**—The contract for the erection of the home for nurses on North Main St., for St. Vincent's Hospital, has been awarded to W. F. O'NEIL, 172 Farmington Ave., Hartford. It will be of brick and concrete, two-stories, 45x197 ft. W. Schmidt, Newfield Bldg., is the Arch.

Bridgeport, Conn.—The Brooklawn County Club plans to build a stone and frame, 100x100 ft. clubhouse. The cost is estimated at $60,000. Henry A. Bishop is Pres. F. E. Hoffman, 15 East 40th St., New York, N. Y., is the Arch.

✚**Hartford, Conn.**—Contracts have been awarded to CURTIS & DEAN, Hartford, for the masonry and the H. B. HIBBARD CO., New Britain, for the carpentry, on the mercantile building at Union Place for Gordon Bros.

New Britain, Conn.—The Board of Education plans to build a pre-vocational high school, costing $121,000. Walter P. Crabtree, 272 Main St., is the Arch.

✚**Waterbury, Conn.**—The contrast for rebuilding the city hall has been awarded to GEORGE A. FULLER CO., New York, at $560,385. Noted Feb. 26.

Buffalo, N. Y.—Bids will be received until June 27, by Francis G. Ward, Comr. of Pub. Wks., for the erection of a library at Niagara and Hamilton Sts. The estimated cost is $40,000. Noted May 28.

Kenneth M. Murchison, Arch., 101 Park Ave., New York, is preparing plans for the erection of a railroad terminal and depot at Main, Scott and Washington Sts., for the Lehigh Valley R.R.

★**Hudson, N. Y.**—(Official)—Bids will be received until 5:30 p.m., July 10, by Miss Mary Hinckley, Pres., Board of Managers, New York State Training School for Girls, Hudson, N. Y., for a Contagious Hospital at the New York State Training School for Girls. For further information see advertisement under "Contracts To Be Let."

New York, N. Y.—(Borough of Manhattan)—The Veronica Realty Corporation, recently organized to manage the properties of W. R. Hearst, will erect a two-story store and office building at Columbus Circle, Eighth Ave. and 61st St. The cost is estimated at $500,000.

New York, N. Y.—(Borough of Manhattan)—The Spring St. Neighborhood House, 246 Spring St., has filed plans for a $100,000 dormitory and gymnasium.

✚**North Tonawanda, N. Y.**—The general contract for the erection of the two-story and basement school at North Tonawanda has been awarded to MORRIS & ALLEN, Builders' Exchange, Buffalo; structural steel sublet to PROGRESSIVE STEEL CO., Buffalo. Noted Feb. 26.

✚**East Orange, N. J.**—The general contract for the addition to the Franklin school has been awarded to the TOBIN MASON & BUILDING CO., at $32,954; heating and ventilating to JOHN J. HESS, Newark, N. J., at $9985.

Newark, N. J.—The Board of Trustees of the Newark City Home will receive bids until July 6, for the erection of an administration building and alterations to the gymnasium. C. Heller is Secy.

The Board of Education will receive bids until June 30, for the erection of an addition to the North Seventh St. school. R. D. Argue is Secy. of the Bd.

New Brunswick, N. J.—The only bid received for improvements to the court house was submitted by George B. Rule, New Brunswick, at $67,590.

✚**Philadelphia, Penn.**—The contract for the erection of a five-story building for St. Mary's Hospital has been awarded to IRWIN & LEIGHTON, Philadelphia, Penn.

The West Philadelphia General Homeopathic Hospital, Philadelphia, has had plans prepared for the erection of a three-story and basement addition to the present hospital. The estimated cost is $100,000.

Sauer & Hahn, Archs., 1112 Chestnut St., are preparing plans for the erection of a building for the Young Mens Hebrew Association. The estimated cost is $75,000.

✚The contract for the erection of a theater at Salford and Filbert Sts., has been awarded to J. A. BADER CO., Heed Bldg., Philadelphia. The estimated cost is $100,000.

✚**Pittsburgh, Penn.**—The Fidelity Title & Trust Co., has awarded a contract to CUTHBERT BROS., Bessemer Bldg., for a seven-story, 36x110 ft., terra cotta front building, costing $90,000.

✚**Nashville, Tenn.**—The contract for the erection of two buildings for the George Peabody College for Teachers has been awarded to the HEDDEN CONSTRUCTION CO., New York, at $300,000.

✚**Louisville, Ky.**—The contract for the erection of the high school has been awarded to BAILEY & KOERNER, Louisville, at $214,250. Noted May 28.

✚**Bowling Green, Ohio**—The contract for the erection of the science and agricultural building at the State Normal School, has been awarded to the STEINLE CONSTRUCTION CO., Fremont, Ohio, at $79,197. Noted May 21.

Cleveland, Ohio—Bids will be received about July 6, by W. S. Lougee, Arch., 501 Marshall Bldg., for the erection of a one-story, 80x408 ft., freight depot, for the Cleveland & Buffalo Transit Co. The estimated cost is $60,000.

✚**Cleveland, Ohio**—The contract for the erection of the four-story building for St. John's Hospital has been awarded to the W. B. ALLISTER CO., 2163 East 31st St. The estimated cost is $200,000. Noted May 28.

✚**Cleveland, Ohio**—The contract for the erection of a six-story recreation building at 6100 Broadway Ave., for the Cleveland Worsted Mills Co., has been awarded to the HUNKIN CONKEY CO., 321 Cuyahoga Bldg., Cleveland, Ohio. The estimated cost is $100,000.

Bids will be received about July 1, for the erection of a gymnasium at the Goodrich House, St. Clair Ave., Cleveland. Briggs & Nelson are the Archs., 669 Rose Bldg.

Paul T. Cahill, Arch., 1900 Euclid Ave., has prepared plans for the erection of a two-story addition to the Lakeside Hospital, Lakeside Ave. The estimated cost is $50,000.

✚**Columbus, Ohio**—The contract for the erection of the office building for the Columbus Iron & Steel Co., has been awarded to L. S. STEWART, Columbus.

Alliance, Ohio—Plans are being prepared by W. Hirsh, Arch., 1302 Swetland Bldg., Cleveland, Ohio, for the erection of a two-story State Hospital at Alliance. The estimated cost is $50,000.

Kent, Ohio—Bids will be received until noon, July 11, by John A. McDowell, Secy., Bd. of Trustees, Kent Normal School, for the erection of an agricultural and training building at Kent. Noted May 14.

✚**Grand Rapids, Mich.**—The general contract for the erection of a two-story and basement school for the Board of Education, has been awarded to BURKE, SMITH & NELSON, Muskegon, Mich. The estimated cost is $50,000.

✚**Chicago, Ill.**—The contract for the erection of a three-story brick apartment at 5300 Greenwood Ave., has been awarded to the THORNE CONSTRUCTION CO. The estimated cost is $100,000.

Appleton, Wis.—Bids will be received until July 1, by E. L. Williams, City Clk., for the erection of an isolation hospital and an invalid hospital at Appleton, Wis.

✚**Ashland, Wis.**—The general contract for constructing the Ashland County court house has been awarded to TOMLINSON & EGAN, at $106,195. Noted Mar. 12.

Green Bay, Wis.—Anderson & Williams, Archs., Green Bay, are preparing plans for the erection of a theater at Kemnitz and North Washington Sts., for Henry Goldman. The estimated cost is $50,000.

Marshfield, Wis.—Bids will be received until June 30, for a high-school addition to McKinley school. Gustave A. Krasin, is the Arch., Marshfield, Wis. Noted Feb. 26.

Milwaukee, Wis.—Bids are being received by Frank M. Harbach, Secy., Board of School Directors, for remodeling Park St. school. The estimated cost is $50,000.

Bids are being received by Frank M. Harbach, Secy., Board of School Directors, for completing Riverside High School. The estimated cost is $300,000.

✚Contracts for the erection of the mercantile building at 12th and Walnut Sts., have been awarded as follows: Carpentry, ERDANN SCHULZ & SONS, masonry, cut stone, RIESEN & RIESEN.

Van Ryn & De Gelleke, Archs., 725 Caswell Block, will receive bids about July 5, for the superstructure of the Washington Park High School at Sherman Blvd. and Wright St. The estimated cost is $250,000.

✚**Wauwatosa, Wis.**—Contracts for the erection of the men's dormitory at Milwaukee County Hospital for Insane, have been awarded as follows: Carpentry, excavating, masonry, steel, O. A. DIEMAN, Waukesha, Wis., $42,810. Noted May 7.

Ottawa, Kan.—The Trustees of Ottawa University contemplate erecting three buildings. The estimated cost is $125,000. W. C. Coleman, Wichita, Kan., is the Pres.

Kansas City, Mo.—Bids will be received until noon, June 29, for completing the Milton Moore School, 81st and Cypress Ave. Charles A. Smith is the Arch., Finance Bldg.

✚**St. Louis, Mo.**—The contract for the erection of a six-story mercantile building for Samuel Hass, 2225 Locust Ave., has been awarded to the W. M. SUTHERLAND BUILDING & CONSTRUCTION CO. The estimated cost is $83,000.

✚**Terrell, Tex.**—The city commissioner has awarded the contract for the erection of the city hall, to BARRY & METCALF, Corsicana. The estimated cost is $40,000.

Seattle, Wash.—Saunders & Lawton, Archs., Alaska Bldg., have completed plans for the erection of a three-story, 120x140 ft., building, for the Masonic Temple Association. The estimated cost is $200,000.

✚**Calexico, Calif.**—The general contract for the erection of the high school, at Calexico, has been awarded to GEORGE HERTZ, El Centro, at $48,789.

J. P. Beck, advertising manager of the Universal Portland Cement Co., won a prize of $10000 at the convention of the Associated Advertising Clubs of America, held in Toronto. The prize offered by "Advertising & Selling" was for the best assay on advertising. Mr. Beck took for his subject "Formulating a Winning Campaign for Cement."

Mr. Beck has, for several years, been manager and general organizer of the cement show.

CONTRACT PRICE

★✚**Rapid Transit System**—New York, N. Y.—Bids were received by the Public Service Commission, June 12, for Route 5, Section 7, of the Rapid Transit Subway. It will be a four-track subway, extending from 43d St. to 53d St. in Lexington Ave. The bidders were: (A) RAPID TRANSIT SUBWAY CONSTRUCTION CO., 165 Broadway, New York, $1,915,164 (awarded contract); (B) MacArthur Bros. Co., 11 Pine St., New York, $2,026,206; (C) The Degnon Contracting Co., 60 Wall St., New York, $2,081,440; (D) Oscar Daniels Co., Woolworth Bldg., New York, $2,117,847; (E) Smith, Hauser & MacIssac, Inc., $2,464,768. The item bids were as follows:

RAPID TRANSIT SYSTEM, NEW YORK, SECTION 7, ROUTE 5

	A	B	C	D	E	F
52,600 cu.yd. earth excavation above mean high water	$3.50	$4.30	$4.50	$4.05	$5.00	$7.50
7100 cu.yd. earth excavation for sewers	4.50	4.30	4.50	4.05	6.50	7.50
116,600 cu.yd. rock excavation	5.00	5.85	6.00	6.60	6.50	7.50
1600 cu.yd. rock excavation for sewers	5.00	5.85	6.00	6.50	7.00	7.50
1200 front ft. underpinning buildings 1 to 6 stories	60.00	65.00	35.00	10.00	80.00	50.00
100 front ft. underpinning buildings 7 to 12 stories	100.00	25.00	50.00	10.00	100.00	100.00
275 front ft. maintaining, protecting and securing	50.00	35.00	20.00	10.00	60.00	50.00
6330 cu.yd. tunnel excavation	8.00	8.60	9.00	6.60	9.00	8.75
28,100 cu.yd. concrete masonry	9.00	9.40	9.50	11.00	10.00	9.00
1970 cu.yd. concrete masonry outside waterproofing	9.00	9.00	9.50	10.00	10.00	9.00
1430 cu.yd. rubble stone masonry	7.00	5.00	8.00	6.00	8.00	7.00
50 cu.yd. dry rubble stone masonry	6.00	4.50	7.00	5.00	8.00	6.00
110 cu.yd. brick masonry	15.00	15.00	15.00	12.00	20.00	20.00
10 cu.yd. vitrified brick masonry	40.00	18.00	20.00	20.00	30.00	25.00
60 cu.yd. hollow terra cotta masonry	15.00	15.00	15.00	15.00	18.00	20.00
1000 bbl. portland cement grout	3.00	3.00	4.00	1.50	3.00	4.00
1000 lin.ft. timber piles	0.75	1.00	0.50	0.40	1.00	0.25
2 M. bd. ft. timber foundations	75.00	65.00	50.00	40.00	100.00	70.00
100 cu.yd. broken stone and gravel	2.50	2.75	2.00	1.50	3.00	2.50
2600 sq.yd. 1-ply waterproofing	0.50	0.38	0.50	0.40	0.40	0.75
100 sq.yd. 2-ply waterproofing	0.75	0.64	1.00	0.70	0.70	0.90
16,700 sq.yd. 3-ply waterproofing	1.00	0.97	1.25	1.25	1.00	1.00
100 sq.yd. 4-ply waterproofing	1.25	1.30	1.50	1.40	1.25	1.50
100 sq.yd. dry-ply	0.50	0.26	0.40	0.40	0.40	0.60
350 cu.yd. brick in asphalt mastic	30.00	31.00	25.00	30.00	28.00	30.00
100 lin.ft. 12-in. vitrified pipe	0.75	1.00	0.80	0.90	1.50	2.00
1000 lin.ft. 10-in. vitrified pipe	0.65	0.80	0.55	0.75	1.25	1.50
2800 lin.ft. 8-in. vitrified pipe	0.50	0.55	0.30	0.60	0.75	1.25
100 lin.ft. 6-in. vitrified pipe	0.45	0.40	0.25	0.40	0.70	1.00
100 lin.ft. 4-in. vitrified pipe	0.40	0.26	0.20	0.30	0.60	0.50
100 lin.ft. 8-in. c.i. pipe	1.50	2.50	1.25	1.50	2.00	1.50
100 lin.ft. 6-in. c.i. pipe	1.00	1.40	1.00	1.00	1.50	1.25
5800 lin.ft. 4-in. c.i. pipe	0.70	0.80	0.75	0.70	1.00	1.00
80 lin.ft. 10-in. c.i. pipe	2.00	3.50	1.50	1.80	2.25	2.00
50 lin.ft. 3-in. extra heavy c.i. pipe specials and fittings	1.00	1.00	1.00	1.00	1.25	1.00
50 lin.ft. 4-in. extra heavy c.i. pipe specials and fittings	1.25	1.35	1.00	1.00	1.50	1.25
120 lin.ft. 6-in. extra heavy c.i. pipe specials and fittings	1.75	2.00	1.50	1.50	2.00	1.50
40 lin.ft. 8-in. extra heavy c.i. pipe specials and fittings	2.00	2.80	1.75	2.00	3.00	2.00
211,200 duct ft. tunnel ducts	0.12	0.10	0.10	0.08	0.12	0.12
10,200 duct ft. railroad ducts	0.20	0.15	0.15	0.11	0.20	0.15
1730 tons riveted steel	68.00	80.00	75.00	70.00	70.00	70.00
2130 tons steel beams and shapes	60.00	70.00	65.00	60.00	65.00	65.00
55 tons steel rods and bars	65.00	60.00	60.00	60.00	65.00	50.00
45 tons c.i. columns	65.00	75.00	60.00	60.00	80.00	70.00
20 tons miscellaneous iron castings	70.00	70.00	60.00	60.00	100.00	70.00
5 tons miscellaneous iron sewer furnishings	70.00	80.00	60.00	70.00	110.00	75.00
4000 lb. special wire forms	0.10	0.10	0.12	0.15	0.10	0.15
6530 lin.ft. 1½-in. oak hand rail	0.60	0.75	1.00	0.10	0.15	0.50
6200 sq.ft. steel gratings	1.50	1.75	1.50	1.50	1.50	1.75
2700 sq.ft. vault lights	1.50	1.50	1.50	1.50	1.50	2.00
4100 sq.yd. street surface restored (sidewalk)	3.00	2.15	2.00	2.00	3.00	2.00
8140 sq.yd. repavement of roadway with asphalt	3.00	3.00	2.50	3.00	3.50	3.00
100 lin.ft. new blue stone curb	1.50	1.00	1.50	1.00	3.00	1.00
4860 sq.yd. repavement of roadway with wood block	4.00	3.00	3.50	4.00	4.00	3.50
100 lin.ft. 8-in. granite curb	2.00	2.00	1.75	1.00	3.00	1.00
3460 lin.ft. ¾-in. w.i. electric conduits in place	0.25	0.15	0.25	0.20	0.20	0.15
400 lin.ft. 1¼-in. w.i. electric conduits in place	0.40	0.28	0.40	0.35	0.40	0.25
150 lin.ft. 2-in. w.i. electric conduits in place	0.50	0.35	0.60	0.50	0.50	0.35
550 lin.ft. 1-in. w.i. electric conduits in place	0.30	0.23	0.30	0.30	0.30	0.20
335 each c.i. outlet boxes in place	1.00	0.85	1.00	1.00	1.50	2.00
6 each c.i. pull boxes in place	5.00	4.00	5.00	2.00	2.50	5.00
100 lin.ft. 6-in. extra heavy c.i. pipe specials and fittings	2.00	1.50	1.50	1.50	1.50	1.50
50 lin.ft. 3-in. extra heavy c.i. pipe specials and fittings	1.00	1.00	1.00	1.00	1.25	0.75
900 lin.ft. 12-in. vitrified sewer pipe	4.00	4.00	4.00	3.00	3.00	3.00
1000 lin.ft. 15-in. vitrified sewer pipe	4.50	4.60	4.50	3.50	3.50	4.00
750 lin.ft. 18-in. vitrified sewer pipe	5.00	5.00	5.00	4.00	3.75	5.00
300 lin.ft. 22-in. vitrified sewer pipe	6.00	5.50	5.50	5.00	4.50	5.50
1450 lin.ft. 24-in. vitrified sewer pipe	6.50	6.00	6.00	5.50	5.50	6.00
9 tons c.i. pipe straight	45.00	45.00	60.00	35.00	80.00	70.00
4 tons c.i. pipe specials	75.00	80.00	100.00	65.00	110.00	75.00
600 lin.ft. 3 ft. 6 in. x 2 ft. 4 in. sewer	15.00	7.00	10.00	6.00	9.00	8.00
60 lin.ft. 4 ft. x 2 ft. 8 in. sewer	16.00	8.00	11.00	7.00	15.00	9.00
5600 lin.ft. maintaining St. Ry. underground trolley	12.00	7.00	12.00	28.50	15.00	12.00
2400 lin.ft. 6-in. water pipe in place	1.00	0.75	1.50	0.50	0.60	1.25
200 lin.ft. 12-in. water pipe in place	1.80	1.50	2.50	2.00	2.50	2.00
1500 lin.ft. 20-in. water pipe in place	2.50	2.50	3.50	3.00	3.00	3.00
50 each water services restored	20.00	15.00	25.00	10.00	20.00	15.00
200 lin.ft. 4-in. c.i. gas pipe	0.90	0.60	1.00	0.60	0.50	0.75
3000 lin.ft. 6-in. c.i. gas pipe	1.00	1.00	1.25	0.50	0.60	1.25
1600 lin.ft. 8-in. c.i. gas pipe	1.25	1.25	1.50	1.00	1.00	1.35
100 lin.ft. 10-in. c.i. gas pipe	1.50	1.50	1.75	2.00	1.20	1.50
100 lin.ft. 12-in. c.i. gas pipe	1.75	1.70	2.00	2.50	2.00	2.00
1500 lin.ft. 16-in. c.i. gas pipe	2.00	2.00	2.50	2.75	2.00	2.50
100 lin.ft. bypass above 6 in.	3.00	2.50	4.00	3.00	3.00	4.00
6700 lin.ft. bypass above 8 in.	4.50	3.00	4.50	3.50	4.00	5.00
100 lin.ft. bypass above 12 in.	6.00	4.00	5.00	7.00	6.00	7.00
100 lin.ft. bypass on trestle 12 in.	7.00	5.50	5.00	9.00	6.50	8.00
1500 lin.ft. bypass on trestle 20 in.	12.00	6.50	7.00	11.00	7.00	10.00
100 lin.ft. bypass on trestle 24 in.	15.00	8.00	8.00	17.00	12.00	15.00
100 lin.ft. bypass on trestle 6 in.	5.00	2.50	4.00	3.00	2.00	5.00
100 lin.ft. bypass on trestle 8 in.	6.00	3.00	4.50	4.00	2.50	6.00
1500 lin.ft. trestle	4.00	3.00	2.00	4.00	5.00	5.00
600 lin.ft. 4-in. w.i. gas pipe in place	1.00	0.90	1.00	0.70	0.50	2.50
100 lin.ft. 6-in. w.i. gas pipe in place	1.25	1.20	1.25	1.25	0.60	3.00
1700 lin.ft. 8-in. w.i. gas pipe in place	1.50	1.60	1.50	1.70	1.00	4.00
100 lin.ft. 10-in. w.i. gas pipe in place	2.00	2.00	1.75	2.00	1.20	5.00
50 gas services restored	20.00	15.00	25.00	10.00	20.00	15.00
65 tons new c.i. water and gas pipe	40.00	40.00	40.00	35.00	70.00	40.00
100 lin.ft. new w.i. gas pipe, 4-in.	1.25	0.85	1.00	0.60	0.75	2.50
100 lin.ft. new w.i. gas pipe, 6-in.	1.50	1.10	1.25	1.20	1.00	3.00
200 lin.ft. new w.i. gas pipe, 8-in.	2.00	1.60	1.50	1.50	1.75	4.00
100 lin.ft. new w.i. gas pipe, 10-in.	2.50	2.00	1.75	2.00	2.50	5.00
15 tons special c.i. pipe	75.00	86.00	60.00	65.00	110.00	70.00
3500 lb. malleable iron fittings for gas pipe	0.12	0.10	0.05	0.15	0.20	0.15
1500 lin.ft. 8-in. air pipe in place	2.50	1.50	1.25	3.00	1.00	2.00
100 lin.ft. new 8-in. air pipe	2.50	1.50	1.25	3.00	1.75	3.00
300 lin.ft. 8-in. mail tubes in place	3.00	2.00	7.00	3.00	2.00	3.00
100 lin.ft. new 8-in. mail tubes in place, straight pipe	3.00	3.00	5.00	4.00	4.00	5.00
50 lin.ft. new 8-in. mail tubes in place, curved pipe	4.00	4.00	6.00	8.00	6.00	10.00
98,000 lin.ft. electric ducts and conduits in place	0.50	0.40	0.60	0.30	0.50	0.65
24,000 lin.ft. 2½-in. w.i. duct pipe	0.75	0.45	0.75	0.30	0.50	0.50
30,000 lin.ft. 3-in. w.i. duct pipe	0.60	0.50	0.75	0.30	0.55	0.60
1500 lin.ft. 3½-in. w.i. duct pipe	0.65	0.60	0.75	0.30	0.80	0.75
600 lin.ft. 4-in. w.i. duct pipe	0.70	0.75	0.75	0.30	1.00	1.00
50 electric services restored	20.00	25.00	25.00	12.00	25.00	25.00
Totals	$1,915,164	$2,026,206	$2,071,440	$2,117,847	$2,313,200	$2,464,768

Contracts to Be Let

Bids received until June 30, 1914.

Proposals for State Road Work

SEALED PROPOSALS will be received by the State Highway Commissioner, Room 27, Capitol, Hartford, Connecticut, until 2 P. M., Tuesday, June 30th, 1914, for State Road Work in the following towns in accordance with plans and specifications on file in the office of the State Highway Commissioner and also at the following places:—TOWN OF PUTNAM, about 6307 linear feet of Native Stone Bituminous or Trap Rock Bituminous Macadam construction. Plans and specifications at the Town Clerk's Office, Putnam. TOWN OF MANCHESTER, about 3425 linear feet of plain or reinforced concrete pavement. Plans and specifications at the office of Robert W. Stevens, Division Engineer, Room 407, Connecticut Mutual Building, Hartford. CITY OF HARTFORD, about 8000 linear feet of Warrenite, Amiesite, Topeka or Concrete Pavement (Plain or Reinforced) also a section of brick pavement over a concrete base. Plans and specifications at the office of Leon F. Peck, Superintendent of Streets, Hartford TOWN OF SALISBURY, about 4040 linear feet of graded road with six (6) inch hardening course. Plans and specifications at the office of R. S. Hulbert, Division Engineer, Winsted. TOWN OF WATERTOWN, about 6450 linear feet of Trap Rock Macadam, Native Stone Macadam or Gravel construction. Plans and specifications at the Town Hall, Watertown. TOWN OF BROOKLYN, about 4850 linear feet of Native Stone Macadam construction. Plans and specifications at the Town Clerk's Office, Brooklyn. TOWN OF WESTBROOK, about 4365 linear feet of Native Stone Macadam construction or Graded road with two (2) inch Native Stone surface. Also a re-surfacing of a section of road adjoining. Plans and specifications at Town Clerk's Office, Westbrook. TOWN OF ESSEX, about 12,000 linear feet of Trap Rock or Native Stone resurfacing. Plans and specifications at Town Clerk's Office, Essex. All bids must be accompanied by a surety company bond or a certified check not less than one-third of the cost of the work. The State Highway Commissioner reserves the right to reject any and all bids.

Dated at Hartford, Conn., June 19th, 1914.

C. J. BENNETT, State Highway Commissioner,
ROOM 27, Capitol, Hartford, Conn.

Bids received until June 30, 1914.

Notice

LETTING OF CONTRACT FOR TWENTY-TWO MILES OF ROAD

Sealed bids for the construction of twenty-two miles of macadam or gravel and rock or gravel highways in Road District No. 2 Lincoln County, Arkansas, will be received by the Board of Commissioners for the said district at Star City, Arkansas, until 10 A.M., June 30, 1914, all material and labor to be furnished by Contractor.

Also with Commissioners furnishing materials. Contractor furnishing all labor and tools.

Each bid must be accompanied by a certified check for 1% of the bid, to be returned if the proposal is not accepted. Specifications, plans and proposal sheets may be obtained at the office of the Department of State Lands, Highways and Improvements, New State House, Little Rock, Arkansas, or at the office of Chas. Moore, Pine Bluff, Arkansas, and at the office of Hon. A. J. Johnson, Attorney for the Board of said Improvement District, Star City, Arkansas.

A deposit of $10 is required for the safe return of plans.

No bids will be considered unless made on the proposal sheet furnished either by the Department of State Lands, Highways and Improvements, or the Secretary of the Board of Commissioners for the District. The right is reserved by the Board of Commissioners to reject any and all bids.

C. O. BACON,
Chairman Board of Commissioners.
HUGH R. CARTER,
State Highway Engineer.
CHARLES MOORE,
Resident Engineer.

Bids received until July 6, 1914.

Storm and Sanitary Sewers

San Antonio, Texas, June 10th, 1914.

Sealed bids will be received by the undersigned until 4.00 p.m., July 6th, 1914, for the construction of Storm and Sanitary Sewers for the City of San Antonio, sizes and quantities being approximately as follows to wit:

STORM SEWERS

7070	feet	of 76″	sewers
690	feet	of 74″	sewers
742	feet	of 72″	sewers
1840	feet	of 68″	sewers
980	feet	of 64″	sewers
2380	feet	of 60″	sewers
940	feet	of 58″	sewers
950	feet	of 54″	sewers
470	feet	of 52″	sewers
390	feet	of 50″	sewers
1030	feet	of 44″	sewers
1340	feet	of 42″	sewers
6735	feet	of 36″	sewers

And smaller.

For the above alternate bids on molder reinforced concrete, monolithic concrete, vitrified liners, and vitrified segmental blocks will be considered.

SANITARY SEWERS

650	feet	of 58″	sewers
3330	feet	of 46″	sewers
750	feet	of 44″	sewers
1060	feet	of 38″	sewers
6040	feet	of 36″	sewers
2735	feet	of 30″	sewers
2095	feet	of 24″	sewers
8440	feet	of 20″	sewers
3330	feet	of 18″	sewers
2865	feet	of 15″	sewers
5050	feet	smaller	sizes

For all sizes over 24″ alternate bids on vitrified pipe, vitrified segmental, block concrete, vitrified segmental liner, molded reinforced concrete, and monolithic concrete will be considered.

For specifications, bidders blanks and other information address Hans Helland, City Engineer.

FRED FRIES,
City Clerk, City of San Antonio.

Bids received until July 10, 1914.

Proposals for Brick Road

Tampa, Fla., June 8, 1914.

Sealed proposals will be received at the office of the County Commissioners of Hillsborough County, Florida, until 10 A.M., July 10th, 1914, for furnishing paving brick or blocks, wood or granite curb, doing the necessary hauling, grading and laying the curbing and blocks upon the Tampa-Plant City Road in said County. Plans and specifications can be seen at the office of the Engineer of roads. Bidders should personally examine the location of the proposed work, and acquaint themselves with all attending conditions. The Road Engineer will furnish bidders with blank forms of proposals; no proposal will be considered unless submitted on such forms. All proposals must be accompanied by a certified check, made payable to the Board of County Commissioners of Hillsborough County, for one (1%) per cent. of the amount of their bid.

The quantities are approximately only:

77,000 Sq.Yds. of brick pavement, of No. 1 brick 9′ wide.
or 128,000 Sq.Yds. of brick pavement, of No. 2 brick 15′ wide.
154,294 Lin. feet of Granite or Wood Curb.

The right is reserved to reject any or all bids. Address all bids to the Clerk of the County Commissioners, Mr. W. P. Culbreath, Tampa, Fla., plainly marking the same, "Bids for the furnishing of material and construction of a brick road between Tampa and Plant City, for Hillsborough County."

For further information, apply to James Riddle, Engineer of Roads, Hillsborough County, Tampa, Florida.

Bids received until July 7, 1914.

Barge Canal Terminals

STATE OF NEW YORK
OFFICE OF SUPERINTENDENT OF PUBLIC WORKS
Albany, June 8th, 1914.

NOTICE TO CONTRACTORS:

Sealed proposals will be received by the undersigned at his office in the Capitol, at Albany, N. Y., until twelve o'clock noon of Tuesday, July 7th, 1914, at which place and hour they will be publicly opened and read, for the construction of Barge canal terminals pursuant to the provisions of Chapter 746 of the Laws of 1911, and of the acts supplementary thereto, as follows:

—1—

TERMINAL CONTRACT NO. 18.

For dredging, filling and constructing bulkheads and a sewer at Gowanus Bay, Borough of Brooklyn, New York City. Contract plans, sheets 1-3.

—2—

TERMINAL CONTRACT NO. 33.

For constructing a terminal pier, excavating channels, removing a portion of United States breakwater, etc., at the end of West First street, Oswego, N. Y.

Contract plans, sheets 1-8.

Plans may be seen and detailed specifications, engineer's estimate of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y., and at the office of the Assistant Superintendent of Public Works at Syracuse, N. Y., at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., at the canal office, Spaulding's Exchange, Buffalo, N. Y., and at the Barge canal terminal office, Room 1219, Whitehall Bldg., 17 Battery Place, New York City.

Copies of detailed plans or drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or the city of New York, issued by a national or State bank or trust company, in good credit within the State and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The amount of bond required for faithful performance will be ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds, co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the State for doing the work, and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the State will be enhanced thereby.

DUNCAN W. PECK,
Superintendent of Public Works.

Bids received until July 14, 1914.

Garbage Reduction Plant Buildings

NOTICE TO BIDDERS.

City of Akron, Ohio.

Sealed proposals will be received at the office of the Director of Public Service, Akron, Ohio, until twelve o'clock noon of the fourteenth day of July, 1914, and then publicly opened and read, for the construction of BUILDINGS for garbage reduction works.

The work to be done includes the construction of brick buildings, concrete foundations, floors and roofs and steam generating plant.

Bids are to be based upon the plans prepared under the direction of the Council of the City of Akron, Ohio. Bids will be made upon the building work as a whole, as well as upon the several branches of the building work, it being understood that portions of the building work may be let separately as follows:

(a) Excavation, embankment and concrete work.
(b) Brick work, cut stone work, steel work, carpenter and mill work, metal windows, roofing, sheet metal work, electrical work, plumbing, painting, hardware and glazing.
(c) Rolling steel doors, metal lockers, castings, industrial equipment and loading conveyor.
(d) Boilers and steam piping.
(e) Brick stack and appurtenances.
(f) Feed water heater and regulator, boiler feed pumps, drain pump and draft regulator.
(g) Railroad track and appurtenances.

Payment will be made as stipulated in the form of contract for the performance of the above work, which form of contract is on file in the office of the Director of Public Service.

Copies of the plans, proposal forms, specifications and forms of bonds and contract can be seen at the office of the Director of Public Service, City Hall, Akron, Ohio, or at the office of the consulting engineer, R. Winthrop Pratt, Hippodrome Bldg., Cleveland, O., or may be obtained by prospective bidders upon depositing Twenty Dollars ($20.00) which sum will be refunded on return of the plans and specifications on or before the 21st day of July, 1914, if same are in good condition when returned. Extra copies of the specifications may be obtained from the consulting engineer upon payment of Two Dollars ($2.00) for each copy, which sum will be refunded if returned copies are in good condition.

Each proposal shall contain the full name of every person, firm or corporation interested in the same and shall be accompanied by a certified check for ten (10) per cent. of the amount of proposal or by a bond with surety or sureties satisfactory to the Director of Public Service for the same amount.

Said bond or certified check is required as a guarantee that if the bid is accepted, a contract will be entered into and the performance of it properly secured.

The contract bond will be for fifty per cent. of the amount of the contract.

The Council of the City of Akron, Ohio, reserves the right to reject any or all bids, waive any informalities in the bids received and to accept any bid which it deems most favorable to the city of Akron, Ohio.

BY ORDER OF THE AKRON CITY COUNCIL.
IRA A. PRIEST, Clerk.

Bids received until July 10, 1914.

Hospital Construction

NOTICE TO CONTRACTORS.—Sealed proposals for construction, heating, plumbing and electric work for Contagious Hospital, also for two new Horizontal Tubular Boilers for the New York State Training School for Girls, Hudson, N. Y., will be received by Miss Mary Hinkley, President of the Board of Managers, New York State Training School for Girls, Hudson, N. Y., until 5:30 o'clock P.M., Friday, July 10, 1914, when they will be opened and read publicly. Proposals shall be enclosed in envelope furnished by the State Architect, sealed and addressed, and shall be accompanied by certified check in the sum of 5% of the amount of bid. Contractors to whom the awards are made will be required to furnish surety company bond in the sum of 50% of the amount of contract within thirty days after official notice of award of contract and in accordance with the terms of specifications Nos. 1922, 1923, 1924, 1925 and 1878. Drawings and specifications may be consulted and blank forms of proposal obtained at the New York State Training School for Girls, Hudson, N. Y., and at the office of the State Architect. Complete sets of plans and specifications will be furnished to prospective bidders upon reasonable notice to and in the discretion of the State Architect, LEWIS F. PILCHER, Capitol, Albany, N. Y.

Bids received until July 21, 1914.

Notice to Water Works Contractors

Sealed proposals addressed to the Clerk of the Board of Trustees of Public Affairs and endorsed "Proposals for Constructing Water Works" will be received by the village of Frankfort, Ross County, O., until twelve (12) o'clock noon of

TUESDAY THE 21ST DAY OF JULY A. D. 1914.

and then and there publicly opened and read by the Clerk, for furnishing the necessary tools, labor and materials and constructing the proposed water works system according to the plans and specifications therefor on file in the office of the Clerk.

Each bid must be accompanied by a cash deposit or certified check on some solvent bank, payable to the order of the Clerk, for an amount equal to five (5) per cent. of the aggregate amount of the proposal, as a guaranty that if this proposal is accepted, a contract will be entered into and the required bond will be furnished for the satisfactory execution of the work.

Plans and specifications can be seen and forms of proposal can be obtained either at the office of the Clerk or the Engineers, the W. J. Sherman Company, 615 the Nasby Bldg., Toledo, Ohio.

The board reserves the right to reject any or all bids.

By order of the Board.

GEORGE H. SCHADEL, Clerk.

Frankfort, Ohio, June 18th, 1914.

Bids received until July 22, 1914.

Water Improvements and Repairs

Hudson, N. Y.

Sealed bids will be received until 7:30 P. M., July 22, 1914, by the Secretary of the Commission of Public Works, of the City of Hudson, N. Y., for furnishing material and labor necessary for water proofing the old wall and constructing a six inch reinforced concrete cut-off wall on the upstream face of the storage dam at Churchtown, N. Y., also repairing the outer face as described in the plans and specifications.

Copies of the plans and specifications are on file in the office of the Commission of Public Works and copies will be mailed upon receipt of Ten Dollars ($10.00). This amount will be refunded upon return of plans and specifications in good condition.

The Commission of Public Works reserves the right to reject any and all bids.

M. J. O'HARA,
City Engineer.

HENRY M. JAMES,
Secretary, Commission of Public Works.

Bids received until July 7, 1914.

Butler Street Viaduct

Wilkes-Barre, Pa.

SEALED PROPOSALS will be received at the City Clerk's Office, Wilkes-Barre, Pa., until Tuesday, July 7th, 1914, at 3 o'clock P. M. for furnishing all labor and materials and constructing and completing a reinforced concrete viaduct in the City of Wilkes-Barre, in accordance with plans and specifications prepared by William M. Torrance, Consulting Engineer, Room 902 No. 171 Madison Avenue, New York City, where plans and specifications are on file; copies of which may be had upon application to B. K. Finch, City Engineer, Wilkes-Barre, Pa. Each application to be accompanied by the sum of $10.00 which will be refunded upon return of plans and specifications in good condition. Proposals to be endorsed "Proposals for Butler Street Viaduct" and addressed to Fred H. Gates, City Clerk, Wilkes-Barre, Pa. Each bid to be accompanied by a certified bank check or Surety Company Bidding Bond in the sum of $1,000.00 conditioned upon the successful bidder entering into a written agreement with the City of Wilkes-Barre within eight days for the work bid upon. The successful bidder will be required to give with the contract a Surety Company Bond, "The Surety Company to be named in his bids to be approved by the City Solicitor, in the sum of $40,000. The City Council reserves the right to reject any or all bids received.

CHARLES N. LOVELAND,
Superintendent of the Department of
Streets and Public Improvements.

Bids received until July 20, 1914.

Proposals for Pier Superstructures

DEPARTMENT OF WHARVES, DOCKS AND FERRIES
555 Bourse Bldg., Philadelphia

June 17, 1914.

Sealed proposals for the construction of the superstructures of Piers 38 and 40 South and adjacent to bulkhead sheds in the Delaware River between Catharine and Christian Streets, will be received until 12 o'clock noon, Monday, July 20, 1914 in the office of the Director of the Department of Wharves, Docks and Ferries, 555 Bourse Building, Philadelphia, and then publicly opened.

Plans, specifications and blank forms upon which bids must be made can be obtained at the office above mentioned upon the deposit of a certified check in the amount of Twenty five Dollars ($25), to cover the cost of making blue prints, etc., which check will be refunded to the bidder upon the return of the drawings and specifications in good condition. The successful bidder will be furnished with all necessary blue prints free of charge.

No bid will be received unless accompanied by a certificate from the City Solicitor of the City of Philadelphia, that the provisions of an ordinance, requiring proposal bonds on all bids exceeding in amount Five hundred Dollars ($500), approved May 25, 1860, have been complied with.

The Director reserves to himself the right to reject any or all bids, as he may deem best for the interest of the City of Philadelphia.

GEORGE W. NORRIS, Director.

Bids received until July 9, 1914.

Bridge

DEPARTMENT OF PUBLIC FINANCES
ACCOUNTING DIVISION
CITY OF NEW ORLEANS.

New Orleans, La., June 8, 1914.

Pursuant to Ordinances Nos. 1256 and 1508 C. C. S., sealed proposals will be received at this office until the hour of 11 o'clock a.m., Thursday, July 9th, 1914, for the erection of a Scherzer Rolling Lift Bridge over the old Basin Canal on the axis of Broad Street, in accordance with plans and specifications on file in the office of the City Engineer. Deposit $500.00 with the City Treasurer, and his receipt or certified check enclosed with bid. Bond 25% of the contract price.

The City Engineer will furnish bidders with a blank form of proposal; no proposal will be considered unless submitted on such form. Bidders must have paid their City License in order that their bids may be accepted.

The City reserves the right to reject any and all bids.

A. G. RICKS, Commissioner.

Bids received until June 30, 1914.

Notice—Bonds for Sale

Sealed bids will be received by the Board of Directors of Road Improvement District No. 2, Lincoln County, Arkansas, for the sale of approximately One hundred and five Thousand ($105,000.00) Dollars, in 6% 20 year bonds at Star City, Arkansas, June 30th, 1914, 3 P. M. The right is reserved by the Board of Directors to reject any or all bids.

For further information address:

Signed: H. R. CARTER,
State Highway Engineer, Little Rock, Ark.

C. O. BACON, Furth, Ark.
J. W. SANDERS, Pine Bluff, Ark.
M. O. ADAMS, Star City, Ark.
Board of Directors.

SEN. A. J. JOHNSON, Star City, Ark., Attorney for District.

Bids received until June 30, 1914.

Sanitary Sewer System

Fayetteville, Tenn.

Sealed proposals will be received by the Board of Mayor and Aldermen of Fayetteville, Tennessee, until 2 P.M., June 30, 1914, at the Mayor's office for the construction of the system of sanitary sewers. Each proposal must be accompanied by certified check equal to $2500.00. For synopsis of the specifications, form of proposal and instructions to bidders, address:

C. H. JENKS, Eng'r., Union City, Tenn.

HIRAM HIGGINS, Clerk, Fayetteville, Tenn.

Bids received until July 1, 1914.

Paving Contracts Nos. 91 and 92

OFFICE OF THE PAVING COMMISSION.
Baltimore, Maryland.

SEPARATE SEALED PROPOSALS, addressed to the Board of Awards, care of the City Register, will be received by him at his office in the City Hall until 11.00 A.M., Wednesday, July 1st, 1914, to grade, curb, pave and repave with Sheet Asphalt, Vitrified Block, Scoria Block or Granite Block, all on a concrete base, the streets, lane and alley listed in the following contracts:

GRANITE BLOCK REPAVING CONTRACT NO. 91.

	from	to
Clay Street	Eutaw St.	Charles St.
Water Street	Calvert St.	South St.
Dark Lane	Lovegrove Al.	Calvert St.
Lovegrove Al.	Dark Lane	Saratoga St.

Granite Block Repaving—5,550 sq.yds.
Certified Check—$450.00

SHEET ASPHALT PAVING AND GRANITE BLOCK REPAVING CONTRACT NO. 92.

	from	to
Eutaw Street	Baltimore St.	Madison Ave.

Sheet Asphalt Paving—8,810 sq.yds.
Granite block Repaving—5,685 sq.yds.
Granite or Scoria Block Paving— 450 sq.yds.
Vitrified Block Paving—1,300 sq.yds.
Certified Check—$1,050.00

The figures above represent the approximate quantities of the principal items appearing in the contract.

Specifications and proposal sheets can be obtained upon application to the office of the Paving Commission, City Hall. A deposit of $5.00 will be required for a specification covering each contract. This will not be refunded unless a bid is filed.

Plans and profiles are on file for the information of bidders in the office of the Consulting Engineer.

The Board of Awards reserves the right to reject any and all bids. A certified check of the bidder on a clearing-house bank, drawn to the order of the Mayor and City Council of Baltimore to the amount as recited above, must accompany each bid.

The successful bidder will be required to furnish bond and to comply with the City Charter respecting contracts.

By order of the Paving Commission.

R. KEITH COMPTON,
Chairman and Consulting Engineer.

J. MYERS HEDIAN,
Secretary.

APPROVED:

JOHN HUBERT,
Acting Presdt. Board of Awards.

Bids received until July 6, 1914.

Bridges

The County Court of Osage County will receive sealed bids up to noon, July 6th, 1914, for the construction of a 70 foot pony truss bridge with concrete floors and concrete abutments near Bonnots Mill, Mo., and also for the construction of a steel bridge, wood floors of two spans One hundred feet each, pier, abutments and approaches, near Koeltztown, Mo.

Plans, specifications and contracts and proposals on file with Lafe Vaughan, County Clerk, Linn, Mo., and H. E. Steinmann, County Surveyor, Linn, Mo.

Bids received until July 14, 1914.

Sanitary Sewers and Disposal Plant

Sealed proposals will be received at the office of the Board of County Commissioners of Franklin County, Columbus, Ohio, until 12 o'clock noon, central standard time, on the 14th day of July, 1914, for constructing a system of sanitary sewers and sewage disposal plant in Franklin County Sewer District No. 1. Specifications, bidding blanks, form of contracts, form and conditions of bonds may be had on application to John Scott, Clerk Board of County Commissioners, Columbus, Ohio, or Burgess & Long, Engineers, Columbus, Ohio.

JOHN SCOTT, Clerk.

Bids received until July 14, 1914.

Passaic Valley Sewerage Commissioners

NOTICE TO CONTRACTORS

Notice is hereby given that the Passaic Valley Sewerage Commissioners have designated Tuesday, the fourteenth day of July, nineteen hundred and fourteen, at two o'clock in the afternoon, as the time when they will meet at their usual place of meeting, Essex Building, Clinton Street, Newark, New Jersey, to receive proposals, in writing, for the construction of a part of Section 12 of the Main Intercepting Sewer consisting of THIRD RIVER CROSSING, in the Town of Nutley and Acquackanonk Township, in Essex and Passaic Counties, in New Jersey.

Particulars that may enable Contractors to judge of the character of the work are given below:

APPROXIMATE QUANTITIES.
Third River Crossing.

Item 1.	Earth Excavation and Refilling, in trench and open excavations, for 120-inch sewer, Inlet and Outlet Siphon Chambers, twin conduits crossing Third River, overflow channel, and other purposes, including all appurtenant work		Lump Sum.
Item 2.	Rock Excavation, in trench and open excavations	10	Cubic Yards.
Item 3.	Concrete Masonry, in place, with Portland cement mortar	3,700	Cubic Yards.
Item 4.	Steel for concrete reinforcement and other purposes	80,000	Pounds.
Item 5.	Rip Rap, in place, including gravel backing	1,100	Long Tons.
Item 6.	Granite block paving, in place	15	Square Yards.
Item 7.	Timber piles, in place	60,000	Linear Feet.
Item 8.	Brick masonry and appurtenant work	5	Cubic Yards.

Drawings, form of contract and specifications, and blank form for proposal may be obtained at the Commissioners' office from William M. Brown, Chief Engineer.

The Commissioners reserve the right to reject any or all bids.

PASSAIC VALLEY SEWERAGE COMMISSIONERS.
JOHN S. GIBSON, Clerk.
June 9, 1914.

Bids received until July 21, 1914.

Waterworks Station, Filters, Machinery and Extension

La Grange, Georgia.

Proposals will be received by the undersigned until 2:30 P.M., o'clock, July 21st, 1914.

The work will include supplying all materials and labor necessary to construct waterworks with all appurtenances, including filters, two brick stations, re-enforced concrete, coagulating and clear water basin, transmission line and electric pumping machinery.

Drawings and details may be examined and blank form of specifications and bid sheet be obtained of T. J. Harwell, City Clerk, or the Consulting Engineer, Atlanta, Georgia.

A deposit of ten ($10.00) dollars will be required for each set of plans which will be refunded on the return of the plans in good condition.

Each proposal must be accompanied by a certified check in the sum of five (5) per cent. of the amount bid, as evidence of good faith upon the part of the bidder.

The City reserves the right to reject any and all bids, or waiving formalities to accept any which may seem to it to be the best for the City of La Grange.

J. D. EDMUNDSON, Mayor.
La Grange, Ga.

JAMES NISBET HAZLEHURST,
Consulting Engineer,
Atlanta, Ga.

Wanted—Water Works

Village of La Rose, Ill., proposes to install a water works system and would like to receive propositions and approximate cost of same from reliable contractors.

Village covers about three acres.

W. E. BERG, Chairman of Comm., La Rose, Ill.

Bids received until July 6, 1914.

State Highway Improvements

Notice to Contractors—State of New York—Office of the State Commission of Highways, Albany, N. Y.—Pursuant to the provisions of Chapter 30, Laws of 1909, as amended by Chapter 646, Laws of 1911 and Chapter 80, Laws of 1913, sealed proposals will be received by the undersigned at their office, No. 55 Lancaster Stret, Albany, N. Y., at 1 o'clock p.m., on Monday, the 6th day of July, 1914, for the improvement of the following highways:

County	Road No.	Name	Approx. Length
Albany	1198	Albany-Glenmont	1.25
"	5499	Albany-Bethlehem Center	2.38
"	1199	Cohoes City: Vliet Ave.	1.03
Allegany	5502	Andover-Alfred Sta.-Almond	12.06
Clinton	5475	Plattsburgh City: Peru & Charlotte Sts.	0.30
Dutchess	5489	Poughkeepsie City: South Ave. & Washington St.	0.79
Jefferson	1197	Carthage-Naumburg, Part 1	1.81
Nassau	1203	Baldwin-Oceanside	1.56
"	1202	Plainview-Massapequa Turnpike	4.41
Ontario	5473	Geneva City: Hamilton Street	1.30
Steuben	1104	Cohocton-Wayland, Part 1	4.09
Steuben	5495	Bath-Hammondsport, Part 2	3.48
Schuyler & Yates	5334-A	Watkins-Yates County Line	7.85
Wayne	5451	Williamson-Sodus	5.94
"	5449	Ontario Center-Williamson, Part 2	2.28
Westchester	5482	Ossining Village	2.17

REPAIR

Repair Cont. No.	Class of Work	Road No.	County	Name	Town
			COLUMBIA		
594	HCT Cold Appl. No guarantee	589		Nevis-Blue Store	Clermont
			DELAWARE		
556	H.O.Appl. No guarantee	216		Roxbury	Roxbury
			DUTCHESS		
672	C.O.Appl. No guarantee	344		Millerton-Northeast Ctr.	Northeast
		537		Amenia-Wassaic	Pawling
		534		Northeast Ctr-Sharon Sta.	and
		612		Pawling-Dover Town Line	Amenia
			LIVINGSTON		
648	HCT Cold Appl. No guarantee	714		Dansville-Mt. Morris, Sec. 1	W. Sparta
		715		Dansville-Mt. Morris, Sec. 2	Groveland
		482		Dansville-Mt. Morris, Sec. 3	Mt. Morris
			ONONDAGA		
613	Bit.Mac.& Conc. Partly guaranteed	328		Valley Road-Marcellus	Marcellus
		329		Valley-Road-Camillus	Camillus
			ORANGE		
674	HCT Cold Appl. No guarantee	153		Newburg-Campbell Hall	Newburg & New Windsor
			ONEIDA		
675	HCT Cold Appl. No guarantee	139		Hamilton Bridge	Vernon
		271		Utica-Oneida Castle, Sec. 2	
			PUTNAM		
673	C.O.Appl.& Bit.Mac. Partly guaranteed	569		Baldwin Place-Mahopac	Carmel

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Commission in Albany, N. Y., and also at the office of Division Engineer Bertrand H. Wait, Realty Bldg., White Plains, N. Y., for highways and contracts in the counties of Columbia, Dutchess, Nassau, Orange, Putnam and Westchester; also at the office of Division Engineer Harvey O. Schermerhorn, Humane Bldg., Albany, N. Y., for highways in the counties of Albany and Clinton; also at the office of Division Engineer Theron M. Ripley, Cleveland Bldg., Watertown, N. Y., for highways in the county of Jefferson; also at the office of Division Engineer James H. Sturdevant, Chamber of Commerce Bldg., Utica, N. Y., for contracts in the county of Oneida; also at the office of Division Engineer Howard E. Smith, 901 Press Bldg., Binghamton, N. Y., for contracts in the county of Delaware; also at the office of Division Engineer Charles J. McDonough, 43 S. Salina St., Syracuse, N. Y., for highways and contracts in the counties of Onondaga and Wayne; also at the office of Division Engineer Perry Wilkin, 423 Cutler Bldg., Rochester, N. Y., for highways and contracts in the counties of Livingston and Ontario; also at the office of Division Engineer Frederick S. Strong, St. Ann Federation Bldg., Hornell, N. Y., for highways in the counties of Allegany, Schuyler, Steuben and Yates.

The especial attention of bidders is called to "Information for bidders" in the itemized proposal, specification and contract agreement.

Proposals for each contract must be presented in a separate sealed envelope endorsed on the outside with the number of the highway or repair contract for which the proposal is made. Each proposal must be accompanied by a draft or certified check issued by a national or State bank in good credit within the State and payable at sight to the order of the State Commission of Highways for an amount equal to at least five per cent. of the amount of the proposal which such draft or check accompanies.

This draft or check will be held by the Commission until the contract and bond are duly executed.

The successful bidder will be required to give a bond for fifty per cent. of the amount of the contract, such bond to be executed by a surety company to be approved by the Commission, or a bond secured by the deposit of collateral securities to be approved by the Commission.

The right is reserved to rejeot any or all bids.

JOHN N. CARLISLE,
Commissioner.

R. K. FULLER,
Secretary.

3031

Bids received until July 14, 1914.

Pumping Station and Equipment

NOTICE TO BIDDERS

Memphis, Tenn., June 15, 1914.

Sealed proposals will be received up to 12 o'clock noon, Tuesday, July 14, 1914, at the office of C. C. Pashby, City Clerk, for furnishing all labor, tools, hauling for and materials necessary for erecting a building to be used as a

PUMPING STATION.

The work will embrace excavation for foundation, driving foundation piles and erecting a concrete and brick building approximately 60 ft. wide by 160 ft. long and 99 ft. high from the bottom of the foundation concrete to the top of the roof.

The lower one-half of the building will be of concrete with a reinforced concrete floor to carry the pumping machinery; the upper one-half will be of brick with steel truss roof.

There will also be included in the construction a discharge basin approximately 25 ft. wide by 130 ft. long, 350 ft. of horse shoe shaped culvert 15 ft. by 25 ft. and a suction basin.

A certified check in the sum of Five Thousand Dollars ($5000.00) deposited in accordance with the terms of the specifications, will be required of each bidder.

ELECTRICAL MACHINERY.

Sealed bids will be received up to 12 o'clock noon, Tuesday, July 14, 1914, for furnishing and erecting the following electrical machinery and auxiliaries:

Four (4)—750 H. P., Wound Rotor, Induction Motors, with horizontal shaft;

Two (2)—300 H. P., Wound Rotor, Induction Motors, with vertical shaft;

One (1)—Complete Switchboard for the control of the above motors with all wiring connections;

Three (3)—667 K. V. A. Single Phase Transformers

Other Auxiliaries.

A certified check in the sum of Twenty Five Hundred Dollars ($2500.00) deposited in accordance with the terms of the specifications, will be required of each bidder.

PUMPING MACHINERY.

Sealed proposals will be received up to 12 o'clock noon, Tuesday, July 14, 1914, for furnishing and erecting the following machinery and auxiliaries:

Four (4) Double Suction, Horizontal Shaft, Centrifugal Pumps, capacity each 300 cu. ft. per second against a normal head of fifteen feet;

Two (2) Vertical Shaft, Single Suction, Centrifugal Pumps, capacity each 80 cu. ft. per second, against a normal head of twenty-two feet;

Complete Suction and Discharge Pipes for above Pumps;

One (1) Twenty (20) Ton Motor Hoist Hand-Operated Traveling Crane.

Two (2) Vertical Shaft Pit Pumps.

Two (2) Rotary, Motor driven Vacuum Pumps of 400 cu.ft. per minute capacity each.

Together with necessary piping and valves.

A certified check in the sum of Twenty-Five Hundred Dollars ($2500.00) deposited in accordance with the terms of these specifications, will be required of each bidder.

The contract for electrical machinery, the contract for the pumping machinery and the contract for the building will be let separately each as a whole.

Plans and specifications may be had from J. H. Weatherford, City Engineer, Room 5, Court House, Memphis, Tenn.

A deposit of Fifty Dollars ($50.00) will be required on each set of plans and specifications which will be refunded on the surrender of the same.

By order of the Board of Commissioners of the City of Memphis.

E. H. CRUMP, Mayor.

Attest: C. C. PASHBY, City Clerk.

Bids received until July 13, 1914.

Reinforced Concrete Power House

Tarentum, Pa., June 17, 1914.

The Tarentum Borough Council will receive bids for the construction of a reinforced concrete power house, as per the plans drawn by Leo Hudson, Consulting Engineer, 1210 House Bldg., Pittsburgh, Pa., up until July 13, 1914, at 7 o'clock P.M. Each proposal is to be presented sealed and addressed to Mr. W. A. Gibson, Borough Secretary, and plainly marked on the lower left hand corner "Proposal for Power House." Each proposal is to have enclosed a certified check or bidder's bond for $300.00 guaranteeing the good faith of the bidder. The successful bidder will be required to give bond for 100 per cent. of his bid for the faithful performance of the work. Plans and specifications may be obtained from the engineer.

Council reserves the right to reject any or all bids.

W. F. DENNY, President.
W. A. GIBSON, Secretary.

LEO HUDSON, Consulting Engineer,
1210 House Bldg.,
Pittsburgh, Pa.

Railroad Construction

A Canadian holding Company own the Charter for a continuous line of railway in Western Canada covering a distance of approximately 1250 miles.

The line traverses a territory rich in coal, timber, oil and various kinds of minerals and also in part the most productive wheat country in the world.

The Company has made reconnaissance, route and location surveys costing about $150,000 and have also made accurate estimates of the cost of construction.

Bonding powers and Government grants considerably exceeding the estimated cost of construction are granted to the Company by Acts of Canadian Parliament.

The holding Company own several valuable tracts of coal, oil and timber lands and also a number of highly valuable terminal sites situated in leading commercial centers.

The Company wishes to place the whole proposed line under construction immediately and is prepared to treat with capitalists or large contractors who will take the construction bonds at an agreed price and build and equip the said proposed lines according to the plans prepared by the Company's Engineers.

Offers will only be entertained from capitalists or contractors of known standing.

Correspondents will therefore kindly give full particulars of their name and address in the first instance.

Address first correspondence to "Canadian Railway Builders," P. O. Box 601, Winnipeg, Canada.

Bids received until July 9, 1914.

Water Works

Greensboro, Md.

Bids will be received and publicly opened on the afternoon of July 9th, at 1 o'clock, 1914, for the construction of a Water System at Greensboro, Md.

General Plans and Specifications may be obtained by forwarding $3 to Hugh T. Downing, Engineer, Dover, Del.

The right to reject any or all bids is hereby reserved.

Address Proposals to TEMPLE SMITH, Secretary
Community of Greensboro, Md.

Bids received until July 2, 1914

Paving

Bids will be received by the Commissioners of Public Works, Corning, New York, until 12 M., July 2nd, for paving of Market and State Streets. About 17,000 square yards of paving will be required.

WILLIAM O. DRAKE,
Supt. of Public Works.

PROPOSALS FOR COAL—War Department, U. S. Engineer Office, Montgomery, Ala., June 3, 1914.—Sealed proposals for furnishing about 40,000 tons of bituminous coal will be received at this office until 12 M., July 3, 1914, and then publicly opened. Information on application. EARL I. BROWN, Maj., Engrs.

Bids received until July 15, 1914.

Sewers

Daytona, Florida, June 8, 1914.

Sealed bids or proposals will be received by the Board of Public Works of the City of Daytona at the City Hall until 3 P. M., Wednesday, July 15, 1914, the principal items as shown by the Engineers' estimate are as follows:

21 miles of 8 to 24 inch vitrified pipe.
430 tons of cast iron pipe.
16,000 lineal feet of 2-inch galvanized iron pipe.
Furnishing two 50-H.P. oil engines and appurtenances.
Furnishing three centrifugal pumps and appurtenances
Furnishing air compressors and appurtenances.
Furnishing Riensch sewage screen.
Furnishing and installing sterilizing outfit.
Installing machinery in sewage pumping station.
Substructure for pumping station and superstructure.
Furnishing and installing 7 sewage ejectors.

Pipe laying contract, consisting of about 21 miles of vitrified pipe, 400 flush tanks and manholes, three miles of cast iron pipe, 4000 lineal feet of 30-inch reinforced concrete pipe, 10,000 cubic yards of excavation, and other items.

Bids must be accompanied by a satisfactory check for five per cent. of the amount of the bid. All bids must be made on blank forms furnished by City. Plans and specifications may be seen at the office of the City Clerk of Daytona, Florida, or at the office of Geo. W. Fuller, Consulting Engineer, 170 Broadway, New York City, or at the office of C. M. Rogers, Engineer, Daytona, Florida. Plans and Specifications will be forwarded by the Engineer upon the receipt of five dollars. The right is reserved to reject any or all bids.

Board of Public Works.
JOS. OSBORN, Chairman.
E. M. CONDIT, Secretary.

Bids received until July 3, 1914.

Notice to Paving Contractors

IN accordance with a resolution of Council of the Borough of West Hazleton, Luzerne Co., Pa., passed June 19, 1914, authorizing the Paving of Broad Street in said Borough.

Sealed proposals will be received until 7 o'clock P.M., Friday, July 3, 1914.

Bids will be received on Brick laid on a 6" cement concrete base with a 1" sand cushion, and also on Sheet Asphalt (both Natural Lake and Residuum material A) laid on a cement concrete base with a 1" asphaltic concrete binder.

The approximate quantities are:

Lin. feet of	Pavement	4,095
" " "	Stone Curbs	7,900
" " "	Concrete Headers	675
Cu. yds. "	Excavation, unclassified, Brick	9,420
	Asphalt	8,220
" " "	Concrete Base	3,600
Sq. yds. "	Pavement	21,625
Number of	Concrete Inlets	11
" "	Grills for old Inlets	8

Samples of materials must be furnished with bid.

Bond or certified check equal to 10% of bid must accompany each bid.

Proposal sheet attached to specifications must be used, unattached.

Council reserves the right to reject any or all bids, to select any material, and regulate the amount of work done during the present year.

Plans, profiles, and specifications may be obtained from the Engineer by depositing $25.00, which will be returned upon the return of said plans, profiles, and specifications.

C. H. MOORE, Boro. Engr.,
Miners' Bank Bldg.,
West Hazleton, Pa.

BENJ. REESE, Pres. of Council.
WM. KRAPF, Sect'y of Council.

TREASURY DEPARTMENT. Supervising Architect's Office, Washington, D. C., June 18, 1914.—Sealed proposals will be opened in this office at 3 p. m., July 30, 1914, for the construction complete (including mechanical equipment, lighting fixtures and approaches) of the United States post office and courthouse at Cookeville, Tenn. Three-story and basement building; ground area, 5,000 square feet; first floor fireproof; stone, ornamental terra cotta, and brick facing; composition and slate roof. Drawings and specifications may be obtained from the custodian of site at Cookeville, Tenn., or at this office, in the discretion of the Supervising Architect. O. WENDEROTH, Supervising Architect.

DEPARTMENT OF THE INTERIOR, U. S. RECLAMATION SERVICE, Washington, D. C., June 18, 1914.—Sealed proposals will be received at the office of the United States Reclamation Service, Los Angeles, California, until 2 o'clock P.M., July 22, 1914, for furnishing material and erecting Riveted Steel Pipes for the Milk River Project, Montana. For particulars address U. S. Reclamation Service, 605 Federal Building, Los Angeles, California, or Washington, D. C. F. H. NEWELL, Director.

U. S. ENGINEER OFFICE, Wilmington, N. C., June 10, 1914.—Sealed proposals for about 1576 tons of steel sheet piling and accessories will be received at this office until 12 M., July 10, 1914, and then publicly opened. Information on application. H. W. STICKLE, Maj., Engrs.

U. S. ENGINEER OFFICE, Jacksonville, Fla., June 2, 1914. —Sealed proposals for dredging in Hillsboro River, Fla., will be received at this office until 12 o'clock, noon, July 2, 1914, and then publicly opened. Information on application. W. B. LADUE, Major, Engrs.

U. S. ENGINEER OFFICE, St. Paul, Minn., June 27, 1914.—Sealed proposals for lock gate operating machinery, valves, operating stands and accessories will be received at this office until 2 p.m., July 27, 1914, and then publicly opened. Information on application. CHAS. L. POTTER, Lt. Col., Engrs.

U. S. ENGINEER OFFICE, Nashville, Tenn., June 17, 1914. —Sealed proposals for drilling for sub-surface investigations of foundations at Dam Sites Nos. 2 and 3, Muscle Shoals, Tennessee River, will be received at this office until 11 a.m., July 17, 1914, and then publicly opened. Information on application. H. BURGESS, Major, Engineers.

DEPARTMENT OF THE INTERIOR, U. S. RECLAMATION SERVICE, Washington, D. C., June 3, 1914.—Sealed proposals will be received at the office of the United States Reclamation Service, Los Angeles, California, until 2 o'clock p.m., July 14, 1914, for furnishing a variable head turbine for the Salt River Project, Arizona. For particulars address U. S. Reclamation Service, 605 Federal Building, Los Angeles, California, or Washington, D. C. F. H. NEWELL, Director.

U. S. ENGINEER OFFICE, Louisville, Ky., June 15, 1914.—Sealed proposals for furnishing and constructing a direct lift bridge over the Louisville and Portland Canal at Eighteenth St., Louisville, Ky., will be received here until 12 noon, central time, July 15, 1914, and then publicly opened. Information on application. J. C. OAKES, Major, Engrs.

DEPARTMENT OF THE INTERIOR, U. S. Reclamation Service, Washington, D. C., June 6, 1914.—Sealed proposals will be received at the office of the United States Reclamation Service, Great Falls, Montana, until 2 o'clock P.M., July 1, 1914, for furnishing about 1,766 linear feet of metal flumes of various diameters, ranging from 5 feet 9 inches to 11 feet 6 inches. For particulars address the United States Reclamation Service, Washington, D. C., or Great Falls, Montana. F. H. NEWELL, Director.

U. S. ENGINEER OFFICE, 405 Customhouse, Cincinnati, O., June 2, 1914.—Sealed proposals for constructing and delivering 10 steel dump scows will be received at this office until 2 p.m., July 2, 1914, and then publicly opened. Information on application. H. JERVEY, Lt. Col., Engrs.

U. S. ENGINEER OFFICE, St. Paul, Minn., June 22, 1914.—Sealed proposals for furnishing excavating machinery of the drag line type fitted with orange peel bucket, for dredge "Manito," will be received at this office until 2 P.M., August 6, 1914, and then publicly opened. Information on application. CHAS. L. POTTER, Lt. Col., Engineers.

U. S. ENGINEER OFFICE, Chicago, Ill., June 6, 1914.—Sealed proposals for repairing, with timber, superstructure of the breakwater at Calumet Harbor, Ill., will be received at this office until 10 A.M., July 6, 1914, and then publicly opened. Information on application. W. V. JUDSON, Lieut. Col., Engineers.

U. S. ENGINEER OFFICE, Newport, R. I., June 1, 1914.—Sealed proposals for dredging in Providence River and Harbor, R. I., will be received at the U. S. Engineer Suboffice, Federal Building, Providence, R. I., until 12 o'clock, noon, June 30, 1914, and then publicly opened. Information on application. JOHN MILLIS, Col., Engrs.

DEPARTMENT OF THE INTERIOR, U. S. RECLAMATION SERVICE, Washington, D. C., June 17, 1914.—Sealed proposals will be received at the office of the United States Reclamation Service, Boise, Idaho, until 2 o'clock P.M., July 22, 1914, for furnishing all material and labor necessary for the construction of a highway bridge, consisting of three 130-foot steel truss spans and wooden trestle approaches, across the South Fork of the Snake River, near Jackson, Wyoming. For particulars address the United States Reclamation Service, Boise, Idaho, or Washington, D. C. F. H. NEWELL, Director.

Classified Advertising

Positions Wanted, 3 cents a word, minimum charge 50 cents an insertion, payable in advance.

Positions Open, (Civil Service Examinations), Employment Agencies (Labor Bureaus), Business Opportunities, Wanted (Agents and Salesmen—Contract Work). For Sale, 5 cents a word, minimum charge, $1.00 an insertion.

Miscellaneous (Educational—Books) 10 cents a word, minimum charge $1.50 an insertion.

Count four words for keyed address care of New York; five for Chicago. Abbreviated words or symbols count as full words.

Copy should reach us not later than 10 A.M. Wednesday for that week's issue. Answers addressed to our care, 505 Pearl St. New York or 1144 Monadnock Block, Chicago will be forwarded (excepting circulars or similar literature).

No information given by us regarding keyed advertiser's name or address.

Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents. Send copies.

Advertisements calling for bids, $3.60 an inch per insertion.

POSITIONS WANTED

Mechanical and Electrical Engineers

MECHANICAL ENGINEER, 35, technical graduate, good designer; 10 years on hoisting machinery, power plants, boiler furnaces, and construction work in general; excellent references; salary, $150. P. W. 959, Eng. News.

GRADUATE MECHANICAL ENGINEER desires to make a change, to enter engineering department of a manufacturing concern, either on construction or testing work; have followed these lines in the past; anxious to be permanently located; age 26. P. W. 957, Eng. News.

Civil Engineers

GRADUATE CIVIL ENGINEER of general experience in concrete and steel design and construction on sewers, bridges, factory buildings and recuperative and regenerative glass tanks, desires position. Louis N. Beals, 4639 Cook Ave., St. Louis, Mo.

CIVIL ENGINEER AND SUPERINTENDENT, 34; seven years' experience railroad location and construction, concrete buildings, heavy concrete construction, tunnel surveying and construction; 2½ years in the tropics; location no object; references. P. W. 899, Eng. News.

CIVIL ENGINEER, 43; twenty years' experience in charge of construction of sewers, water-works, roads and water power; excellent references. P. W. 896, Eng. News.

CIVIL ENGINEER, college graduate; 12 years' broad, practical experience, design and construction, earth, masonry, concrete and steel; extensive water-works experience; excellent record and references. P. W. 901, Eng. News.

CIVIL ENGINEER, college graduate, 31, Assoc. M. Am. Soc. C. E.; eight years experience dry docks, highways, railroads, canals; now in responsible charge of large construction work; salary $200. P. W. 902, Eng. News.

YOUNG GRADUATE CIVIL ENGINEER, with a liking and ability for unusual problems, requiring thorough systematic research and organizing work, wants position with consulting or constructing engineer on general construction work, who is looking for a reliable, resourceful assistant, rather than for a man with long technical experience; 1½ years' experience as structual draftsman, at present employed as such; speaks four languages; good references, salary second consideration; preferably Middle West. P. W. 931, Eng. News, Chicago.

GRADUATE ENGINEER, Assoc. M. Am. Soc. C. E., 36, married; at present in responsible executive position; desires change; reinforced concrete, structural steel or municipal; all correspondence confidential. P. W. 915, Eng. News, Chicago.

ENGINEER OR SUPERINTENDENT (37); civil engineer graduate; 13 years' experience municipal improvements, railroads, industrial plants, reinforced concrete and building construction; good executive, wide experience in contracting and estimating, and can handle work economically. P. W. 933, Eng. News.

CIVIL ENGINEER AND SUPERINTENDENT of small city, 12 years' experience in charge of design and construction of reservoir, pipe lines, sewage works, streets, etc., wishes position as water-works superintendent or city engineer; first class references. P. W. 968, Eng. News.

CIVIL ENGINEER with varied structural experience desires evening work, designing, estimating, checking, detailing and general drafting. P. W. 953, Eng. News.

CIVIL ENGINEER, graduate, 32, 11 years' experience highway, railroad, hydraulic work; surveys, etc.; excellent references. P. W. 962, Eng. News.

CIVIL ENGINEER, assistant construction superintendent; six years' experience dams, foundations, bridges, plain reinforced concrete, railroad work, surveys and general construction; best references; at present employed; available in August. P. W. 965, Eng. News.

TECHNICAL GRADUATE, civil engineer, 24, two years' experience, desires position with engineer or contractor; willing to start at bottom. P. W. 961, Eng. News.

ENGINEER, 32; 13 years railroad maintenance of way on Eastern railroad as transitman, assistant engineer, supervisor track, inspector concrete, yard work, etc. P. W. 930, Eng. News.

Bridge and Structural

MANAGER AND CHIEF ENGINEER—A man of good address and strong personality wants to become associated with a company fabricating structural steel; qualified by education and 15 years' experience in similar lines. P. W. 686, Eng. News.

STRUCTURAL CHECKER on buildings or bridges wants position. P. W. 867, Eng. News.

EXPERIENCED STRUCTURAL-STEEL DESIGNER and estimator wants position in New York City. P. W. 951, Eng. News.

BRIDGE ENGINEER, graduate, 18 years with leading railroads and bridge companies, expert designer steel and masonry, extensive executive, office and field experience; best references. P. W. 954, Eng. News.

STRUCTURAL ENGINEER, graduate, 15 years' experience, rapid draftsman, reliable checker, first-rate designer steel and masonry. P. W. 955, Eng. News.

STRUCTURAL ESTIMATOR AND DESIGNER; nine years' experience buildings and bridges; surveys, detailing, estimating and designing; best references. P. W. 972, Eng. News.

STRUCTURAL, REINFORCED CONCRETE ENGINEER, also mechanical piping, designing, detailing, wants position. Engineer, Box 73, Palisades, N. J.

Surveyors

I. C. S. STUDENT desires permanent position with irrigating engineer, preferably in Colorado, 13 months' experience as rodman and chainman in mountain surveying in East. P. W. 819, Eng. News.

POSITION WANTED IN CHARGE of general municipal or country surveys and construction. P. W. 928, Eng. News.

RODMAN, age 20, I. C. S. student, with more than one year's practical experience, desires position; A1 references. P. W. 950, Eng. News.

Draftsmen

YOUNG MAN, 22, neat draftsman, experienced in building construction, surveying and stonework. P. W. 947, Eng. News.

DRAFTSMAN-STRUCTURAL DETAILER, four years' experience, 23, desires position near New York. P. W. 956, Eng. News.

TECHNICAL GRADUATE desires position; three years' experience on railroad grading, double-tracking and bridge construction, field and office. P. W. 963, Eng. News.

Superintendents, Etc.

CONSTRUCTION ENGINEER, 6 years' experience; design and superintendence of structural steel, reinforced concrete and general building construction. P. W. 858, Eng. News.

A TECHNICAL MAN with 12 years' practical experience well suited to fit himself for a position as mechanical superintendent will be open July 1. P. W. 854, Eng. News.

ACOUNTANT AND BOOKKEEPER, age 33, desires position; thorough knowledge of all duties connected with contractors' office; excellent references; will go anywhere. P. W. 910, Eng. News.

HIGHLY RESPONSIBLE CONSTRUCTION ENGINEER, twenty years' experience location, construction, maintenance, standard railroads, open for engagement; references. P. W. 921, Eng. News.

THOROUGHLY EXPERIENCED SUPERINTENDENT of quarry and crushing plants, good hustler, and able to get results at reasonable cost; also sand and gravel excavating plants; best reference. R. E. Howland, Mount Morris, Ill.

SUPERINTENDENT AND ENGINEER; eight years' experience with railroads and contractors; pile driving, docks, harbor improvements, track work, excavation, masonry; young man, hard worker, highest recommendations. P. W. 952, Eng. News.

SUPERINTENDENT, 22 years experience in every line of narrow and standard gage track work, complicated frog and switch work, yard and terminal construction; thorough knowledge of every detail of track and materials; good executive and hustler; open about July first; location no object; reliable reference. P. W. 949, Eng. News.

ESTIMATOR—Eight years' experience field and office as construction engineer wants position in New York City as estimator; New York interview after July 1; now employed. P. W. 946, Eng. News.

CONSTRUCTION ENGINEER, graduate, 29, broad experience, field and office; expert superintendent, estimator and designer; go anywhere; New York interviews. P. W. 964, Eng. News.

GENERAL SUPERINTENDENT, Assoc. M. Am. Soc. C. E.; seven years' experience as civil engineer on heavy masonry foundations and railway structures, and seven years as superintendent and general superintendent for general contract on buildings, railway structures and large factory plants; open for position soon with general contractor or corporation; best of references. P. W. 945, Eng. News, Chicago.

WANTED—Position by graduate chemical engineer as superintendent of lime and crushed stone plant; thoroughly familiar with operation of kilns, hydrators, quarry crushers, etc.; 10 years' experience construction and operation; at present employed as superintendent, desires change. P. W. 942, Eng. News.

CONTRACTOR'S ENGINEER; thorough knowledge and successful experience in general contract work, both in office and field; executive of ability, initiative and diplomacy. P. W. 969, Eng. News.

CONTRACTOR'S ENGINEER AND SUPERINTENDENT, 30, Assoc. Mem. Am. Soc. C. E., 11 years railroad, heavy concrete, piling, sewer and water construction; good organizer and pusher; salary $150. P. W. 970, Eng. News.

FOREMAN OR GENERAL CARPENTER FOREMAN, difficult or extensive concrete forms, lots of experience, abutments, reducing walls, subway station. P. W. 971, Eng. News.

I'M YOUNG MAN of 30, and have had nine years' experience as foreman of plain- and reinforced-concrete work of various descriptions; my work has been satisfactory to all, both for quick results and economy; would take in charge any concrete job anywhere in the country; best of references. P. W. 960, Eng. News.

YOUNG MAN, 24, at present employed, four years' general surveying, two years' municipal work, including minor general designing (sewers, culverts, retaining walls, etc.); good draftsman; position desired with good chance for advancement. P. W. 941, Eng. News.

SUPERINTENDENT with 16 years' experience on railroad reservoir and heavy steam-shovel work; hustler; expert on handling work at low cost. P. W. 948, Eng. News.

WANTED—Position as assistant superintendent of cement plant; thoroughly familiar with chemical and mechanical details; also familiar with operation lime plant, kilns and hydrators, as well as crushing plant; 10 years' experience; at present employed. P. W. 943, Eng. News.

POSITIONS OPEN

SPECIAL WORK DRAFTSMEN, experienced in detailing both insert and solid manganese, also men with year's experience who can figure layouts. P. 927, Eng. News, Chicago.

A GASOLINE ENGINE and air compressor salesman. Address the Quincy Engine Co., Quincy, Penn.

ASSISTANT ENGINEER on the street paving and sewer work; applicants must have had experience in this kind of work; state age, education, salary expected, experience and earliest date you could report. Address C. H. Bryson, City Engineer, Lima, Ohio.

DRAFTSMAN, technical graduate, experienced design and details, railroad bridges; state education and experience in full; references, salary expected and when report. Send sample. Address W. S. Bouton, Engineer of Bridges, B. & O. R.R., Baltimore, Md.

Civil-Service Opportunities

Competitive examinations for the civil-service positions named below will be held on or up to the dates given. For detailed information, write the United States Civil Service Commission, Washington, D. C., or other addresses specified.

TRANSITMAN (Male)—$800-$900; examination July 22; for vacancy in the Forest Service and positions that become vacant requiring similar qualifications; write for Circular No. 616 and Application No. 1312.

Employment Agencies

The Employment Agencies advertising in this paper agree to refund any registration fee on demand any time within the first six months when no position is secured.

ENGINEERING MEN in every line for available positions. Applicants and employers write, The Toledo Engineering Agency, Toledo, Ohio.

PROFESSOR OF IRRIGATION must have had good teaching experience and practical experience with United States Reclamation Service, $2500. W-18919. Professor of civil engineering, must have had good teaching experience and considerable practical experience in highway engineering, salary $3000-$3700. W-18918. Assistant Professor Architectural design, must have American education, and European study, salary $2000. W-18848. Large list of teaching positions open. The Engineering Agency, Inc. (21st year), Monadnock Building, Chicago.

WANTED

WILL PAY 25c. for copy of "Engineering News," May 13, 1909. T. F. Nichols, State Engineer's Office, Phoenix, Ariz.

AGENTS AND SALESMEN

CLAMSHELL AGENTS—Throughout Michigan, Wisconsin, Minnesota, Dakota, Iowa, Nebraska, Colorado, Oklahoma, Texas, New Mexico; commission; Owen buckets; only men who can deliver desired; territory going fast. Apply G. W. Alden, Western Manager, Fisher Bldg., Chicago.

REPRESENTATIVES wanted to handle an established concrete specialty; 6 years' on the market. Men handling kindred lines preferred. W. 851, Eng. News.

TWO EXPERIENCED ENGINEERS, contemplating starting a selling agency for materials connected with mechanical and building work in southern California, would like to handle on commission a few specialties along these lines. W. 916, Eng. News, Chicago.

DRAFTSMEN-AGENTS to use and sell an improved table, combination angles, etc. D. J. Kelsey, New Haven, Conn.

EXPERIENCED LIME SALESMAN familiar with trade in Kentucky and Tennessee, to work on salary or commission basis; state age, experience and salary expected. W. 973, Eng. News.

BUSINESS OPPORTUNITIES

GREAT OPPORTUNITY—Wanted a man of good business ability and unexceptionable references to buy an interest in and to take the position of general manager in a well known company. B. O. 604, Eng. News.

STATE RIGHTS of an established line of building specialty products will be sold to reliable parties familiar with construction work. Small capital required. B. O. 852, Eng. News.

WANTED, a promoter to establish financially a patented system of building construction, the merits of which have been demonstrated on a large practical scale; his references must be unexceptionable. B. O. 893, Eng. News.

FOR SALE, contracting business with complete equipment, 50 miles from New York. B. O. 920, Eng. News.

DREDGE; sale or charter; owning other business investor considered, competent take full management; salary, half profits. B. O. 958, Eng. News.

CIVIL ENGINEER

Graduate, 1908, leading technical school; four years' experience instrument man and draftsman, filtration, sewage disposal, and general municipal engineering; four years railroad engineering of which last three chief draftsman and principal assistant to engineer in charge on designs and estimates for maintenance and construction; hard worker with ability and high credentials, experienced and can handle men. **P. W. 932, Eng. News, Chicago.**

Classified List

Second Hand Machinery, Material and Equipment

For Sale—Exchange—Rent—Wanted

Rates: Less than 4 insertions 50 cents per line—4 to 11 insertions 40 cents per line—12 or more insertions 35 cents per line

Items not otherwise marked list equipment for sale.

ADDRESSES

ANDERSON CO., I. E., 21 Park Row, New York City.
BRADEN, James C., 26 Cortlandt St., N. Y. City.
CONTRACTORS' Service Co., 50 Church St., N. Y. City.
DALLETT & CO., Harrison Bldg., Phila., Pa.
DOUGLAS, Geo. B., 29 Broadway, New York.
GITHENS Co., Geo. S., 200 Congress St., Boston, Mass.
GIVIN Co., Herbert, 30 Church St., N. Y. City.
GLAZEBROOK, H. McK., 6 Church St., New York City (Telephone, Cort. 507).
GRIMSHAW Co., Wm. B., 688 Drexel Bldg., Phila., Pa.
HARPER Machinery Co., 50 Church St., New York City, N. Y.
LINES FLYNN Co., Inc., 30 Church St., N. Y. City.
MacGOVERN & Co., Inc., 114 Liberty St., N. Y. City.
MARINE Metal and Supply Co., 167 South St., N. Y. City.
PIPE & Contractors Supply Co., 3 Dover St., N. Y. City.
SAMPSON Co., Geo. H., 13 Pearl St., Boston, Mass., and 42 B'way, N. Y. C.; or Winston & Co., Brown Station, N. Y.
SCHMIDT, Jr., & Co., C. G. A., Empire Bldg., Phila., Pa.
SHERWOOD, E. C., 50 Church St., New York, N. Y.
SOUTHERN Iron & Equipment Co., Atlanta, Ga.
SPROUL, Harvey B., Peekskill, N. Y.
STALLEY, G. T., Box 390, Cleveland, Ohio.
WEMLINGER Co., Inc., 11 Broadway, N. Y. City.
WHITNEY, O. R., 39 Cortlandt St., N. Y. C. (Cort. 6095).
WILSON, E. H. & Co., Arcade Bldg., Phila., Pa.

AIR COMPRESSORS

2 2500 Ft. Ingersoll-Rand Corliss Cross Compound Steam and Air; 2 3500 Ft. Ingersoll-Rand Corliss Cross Compound Steam and Air; Boilers and Condensers for the above. All in good order and condition.—SAMPSON.

1 284 Ft. Rand Type XI Belt Driven Low Pressure.—SAMPSON.

1 8x8x12—98 cu.ft., Class C, Straight Line.—SAMPSON.

1 236 cu.ft. 12¼x12 Class F Ingersoll-Rand Straight Line Steam Driven.—SAMPSON.

2 134 cu.ft. 10x10 Class E Straight Line Ing.-Rand Belt Compressor.—SAMPSON.

1 69 cu.ft. 8x8 Knowles Straight Line Belt Driven Compressor.—SAMPSON.

1 235 cu.ft. 12x12 Straight Line Chicago Belt Driven Compressor.—SAMPSON.

1—4750' Rand B. B. 3 compound steam and air compressor with condenser.—SAMPSON.

2—28" & 17" x 24" Ingersoll-Rand Imperial, type 10-2, belt driven, cross compound, capacity 2300 cu. ft. @ 100 lbs.—MacGOVERN.

We are specializing on second-hand, all makes, types and sizes. Ask us for prices.—GITHENS.

Portable 150' gasoline compressor.—ANDERSON.

Portable compressor and cleaning outfit.—ANDERSON.

Abenaque mounted compressor outfit, 15 H.P. gasoline.—SPROUL.

For Quick Sale—One Ingersoll-Rand Class "PE2," Compound air cylinders 17¼"x10¼"x16", 878 cu.ft. per min., 100 lbs. pressure, direct connected on shaft to 150 H.P. G. E. Co., 200 v. direct current 225 R.P.M. motor, Clearance controller. Outfit has run 150 hours. Attractive price to move quickly. Write or wire.—GITHENS.

ASPHALT PLANT

[Wanted—to rent]

One-car plant beginning June 1 for two months.—SPROUL.

BOILERS

1—345 HP Heine, marine casing, 200 lb. pressure, complete. New Boiler. For immediate sale, $1500.—LINES FLYNN.

1 267 HP. Babcock & Wilcox, 150 lbs.—MacGOVERN.

4—100 H.P. Fire Box, Return Tubular, Tico type, never been used, guaranteed by Bond and Hartford papers.—F. S. 967, Eng. News.

BUCKETS

Eight 1½ yd. "Excelsior" dump buckets, cheap.—WHITNEY.

Hayward Orange Peel, ¾ cu.yd. capacity.—WEMLINGER.

6—¾ Cu.Yd. "Eclipse" Bottom Dump concrete buckets good condition.—WEMLINGER.

5—¾ Cu.Yd. capacity Coal Tubs.—WEMLINGER.

2—¾ Cu.Yd. capacity "Ideal" Patent Controllable Form Buckets with standard.—WEMLINGER.

One four leaf 1 yd. Orange peel.—PIPE & C. S. CO.

1 "Haiss" ¾ yd. and 1 "Haiss" 1 yd. clamshell ,in first-class shape; used short time. Digging teeth can be installed.—GEO. HAISS MFG. CO., 142nd St. and Rider Ave., N. Y. City.

BUILDINGS

Steel frame for building 16' high, 52' wide, 180' long, built up columns.—GLAZEBROOK.

CABLEWAYS

1—300' span.—1—600' span—1—1000' span.—GIVIN.

CARS

[Standard Gauge]

A number of low price passenger coaches suited for camp cars.—WILSON.

30 yd. steel automatic air dump for sale or will lease on attractive terms.—F. W. TRIMBLE, 17 Battery Pl., N. Y. C.

[36" Gauge]

50—4 yd. 2-way cars.—GLAZEBROOK.

[24" Gauge]

8—36 cu.ft. V shape Koppel, 2 with brakes.—SCHMIDT.

CRUSHERS

Farrel Jaw, 15x9, with screen and engine.—MARINE.

National Jaw, 14x8, on wheels.—MARINE.

Climax 2½ crusher complete with engine and boiler, bins, elevator, etc., all mounted.—SPROUL.

1 Aurora 11x16" jaw, on wheels, price $200.—SHERWOOD.

DRAG LINE MACHINES

1. Lidgerwood, 60' boom, A1—$3500.—CONTRACTORS S. Co.

ELECTRICAL EQUIPMENT

Shunt wound 10 HP. 220 v. 800 speed motor.—ANDERSON.

1 General Electric 30 HP. direct-current 220 V. 1100 R.P.M. Motor.—SHERWOOD.

ELEVATING GRADERS

Sell 20% cost price.—HARPER.

ENGINES

1 8 HP. Vertical Type Fairbanks Gasoline Engine with sub-base.—SAMPSON.

13"x34" Brown-Corliss, R. H., 115-150 H.P.—MacGOVERN.

16"x16" Erie Ball, 250 RPM., R.H., 250 HP.—MacGOVERN.

1—5 H. P. Mietz & Weiss.—PIPE & C. S. CO.

1 Old Style Warner water-power engine with shieves and cable, cap. 1000 lbs. with 57 lbs. pressure.—THE J. T. HINTON CO., Paris, Ky.

EXCAVATORS

⅝ Cu.Yd. Bishop, Excavator, complete, with carriage and 11 ft. Arm (Wood) in good condition.—WEMLINGER.

GENERATING SET

1 Horizontal McIntosh and Seymour Tandem Compound Condensing Belted Engine 11"x20"x30" 240 H.P., 150 R.P.M. with belt; fly-wheel 32" face x 11 ft. diameter, weight 13,000 lbs.; one G. E. A.C. Belt Driven Three Bearing Generator A.T.B. 16-250-450-2300 3 phase 60 cycle. Above outfit in first class operating condition, and could be delivered immediately.—THE AMERICAN RAILWAYS CO., Witherspoon Bldg., Philadelphia, Pa.

HOISTS

3 75 H.P. 3-drum Flory electric hoist with G.E. motors, 60 cycle, 220-volt.—MacGOVERN.

Electric 25 HP. DD. and swinger, Alt.—ANDERSON.

Electric 75 HP. 3-drum and swinger, Alt.—ANDERSON.

Electrics, 10 to 100 HP.; all types; good condition.—JOHN J. MOORE, 2116 Monroe St., Chicago, Ill.

Most items are signed with only part of the advertiser's name. Complete names and addresses in alphabetical order will be found under the heading "Addresses."

HOISTING ENGINES

Lidgerwood 10x12 D.D.D.C. side by side drums, 33" diam.—MARINE.

Lidgerwood, 5x8 D.D.D.C. with boiler.—MARINE.

Mundy 6½x12, D.D.D.C. complete with boiler.—Lidgerwood Rotary Swinger.—WEMLINGER.

Mundy 6½x12, D.D.D.C. complete with boiler, condition good.—WEMLINGER.

Orr & Sembower 6¼x8, D.D.D.C. complete with boiler and swinging gear, condition good.—WEMLINGER.

Lambert 7½x10, D.D.D.C. complete with boiler and swinging gear, condition good.—WEMLINGER.

2—Lamberts 8½x10 D.D.D.C. complete with boiler and swinging gear.—WEMLINGER.

12 Lidgerwood, Lambert and others. Also one 5 lever Stroudsburg 7x10 cableway engine. PIPE & C. S. CO.

25 H.P. D.D.D.C., without boiler, almost new. Quick shipment.—C. C. DAY, Columbus, Miss.

INSTRUMENTS, SURVEYING

Second-Hand Transits, Levels, etc. Bought, sold or exchanged. Send for list of Second-Hand Instruments. Get our prices before ordering. WILLIAMS, BROWN & EARLE, Inc., Engineering Supplies, Dept. E, 918 Chestnut St., Phila.,

Complete Buff Dumpy level, new; $65.—F. S. 966, Eng. News.

LOCOMOTIVES

[Standard Gauge]

1 Porter, Std. G., 20-ton, 12x18, saddle tank.—DOUGLAS.

1 24 ton 12"x18" four wheel Porter saddle tank. Will pass rigid inspection.—WILSON.

1 38 ton 12"x14" Climax geared locomotive. Thoroughly overhauled.—WILSON.

50 locomotives, Switch, Mogul, Consolidation, Ten Wheel and Saddle Tank types.—SOUTHERN.

2—40 ton switchers, overhauled.—CONTRACTORS S. CO.

3—40 ton Baldwin switchers, new 1912.-CONTRACTORS S. CO.

1—18x24 American 4-driver saddle tank.—GIVIN.

2—13x18 Davenport, 4-driver, S. T. nearly new.—GIVIN.

1—17x24" Schenectady, 4-driver with tender.—SCHMIDT.

[36" Gauge]

10 10x16" Porter, Davenport and Vulcans.—SOUTHERN.

5 9x14" Porters.—SOUTHERN.

1 10x16 Vulcan S. T. ext. front, nearly new.—DALLETT.

10—10x16 locomotives.—GLAZEBROOK.

1 Baldwin 10x16" 16-ton Dinkey, steam brakes.—SHERWOOD.

LOCOMOTIVE CRANES

4 and 8-wheel, 10, 15 and 20 tons capacity.—HOISTING MACHINERY Co., 48 Church St., New York City.

15-ton, excellent condition; cheap.—STALLEY.

1 Browning, 8-wheel, 15-ton Std. Gauge.—GLAZEBROOK.

4 and 8 wheel 10 and 15 ton.—CONTRACTORS S. CO.

2 Brown Hoist 10-ton standard gauge.—GLAZEBROOK.

1—15 ton 8-wheel Browning, 50' boom.—GIVIN.

1—10 ton 4-wheel Brown hoist, 40' boom.—GIVIN.

1 Browning 4-wheel, type 8, capacity, 15 tons; 42" boom.—M \C GOVERN.

Eight-wheel Browning, 15 ton, with 46' boom. New March this year.—GRIMSHAW.

15-ton, 4-wheel, S. G. 50' boom Browning.—DALLETT.

MIXERS (Asphalt and Concrete)

Hadsel 2 yd. Batch, with engine,—on channels.—MARINE.

Smith ¾ yd. Batch with engine,—on skids.—MARINE.

Foote (cont.) No. 3, 7½ H.P. motor D.C. on wheels.—MARINE.

Portable plant, complete capacity 300-600 yds. per day; rare bargain.—LINES FLYNN.

Foote cont. No. 3, gasoline or steam, $350 ea.—ANDERSON.

1 Foote Batch ½ yd. mounted, with engine and boiler.—SPROUL.

1—Chain Belt, Size No. 1, ½ cu.yd. cap. steam engine, boiler and water tank, on trucks, almost new.—WEMLINGER.

1—Foote No. 2 on trucks with gasoline engine, condition good.—WEMLINGER.

2—Chain Belt, ½ Yd. Mixer, steam engine and boiler, side loader and water tank.—WEMLINGER.

1—Ransome No. 1 with Steam Engine and Boiler, also 20 cu.ft. super-hopper on trucks.—WEMLINGER.

1—½ Yd. Chicago Cube, Steam Engine and boiler and side loader, on trucks, good as new.—WEMLINGER.

1—No. 6 Chicago Cube, new Gasoline Engine. Side Loader, on trucks, condition good.—WEMLINGER.

2—No. 20 Lakewood Mixers, Steam engine and boiler, side loader, and water tank, used but little.—WEMLINGER.

1—21 cu.ft. Ransome with gasoline Engine or steam Engine and boiler, on trucks, condition good.—WEMLINGER.

1—Junior Polygon, capacity 6 cu.ft. gasoline engine, on trucks.—WEMLINGER.

1—Little Wonder "FOUR" on trucks, gasoline engine—used only few days demonstrating.—WEMLINGER.

½ yd. Ransome with loader—on wheels—gasoline driven; 3—¾ yd. and 2—½ yd. Ransomes with engines—on skids. Two No. 2½ Smiths with engines—on wheels.—PIPE & C. S. CO.

Ransome Model 60 Street Paver; used 3 mos.—GRIMSHAW.

Portable batch concrete gasoline; sell ¼ cost.—HARPER.

PILING, SHEET STEEL

400 Pieces Lackawanna Steel Sheeting 12" by 18'. Condition of sheeting good. Located at Lyons, N. Y. Apply GREAT LAKES CONSTRUCTION CO., Lyons, N. Y.

1200 pieces Lackawanna and Carnegie, 12 to 25' long, 7 to 12" wide.—GRIMSHAW.

PIPE

All sizes. ½" to 12" with perfect threads and couplings, also larger sizes. Pipe cut to sketch. PIPE & C. S. CO.

PUMPS

1 Cameron 3½x2x4 Steam pump.—SAMPSON.

1 No. 8, 1 No. 9, 1 No. 10 Cameron.—MARINE.

2 Davidson Simplex 9x9x11.—MARINE.

1 Worthington Duplex 6x4x6.—MARINE.

1 Worthington Duplex 10x6x10.—MARINE.

2 Snyder-Hughes Vacuum 10x14x12 Simplex.—MARINE

1 No. 486 Emerson, 4" suc., 3" dis.—MARINE.

2 Worthington 1,500,000 gal. Horizontal, Duplex Power, 14" diameter, 10" stroke.—WATER & LIGHT COMMISSION, Fergus Falls, Minn.

RAILS

500 ft. 24" gauge 20 lb. portable track.—SCHMIDT.

100 tons 45 lb. rail with splice bars.—GLAZEBROOK.

15 miles—40 and 45 lb., splices, New York delivery.—GIVIN.

24" and 20" industrial rail and turntables.—PIPE & C. S. CO.

ROAD MACHINES

Buckeye reversible steel blade, sell ¼ cost.—HARPER.

ROAD ROLLERS

10-ton Buffalo Pitts with compl. road plant.—ANDERSON.

10-ton gasoline road roller. Used very little. Will make exceptionally low price. Write F. S. 778, Eng. News.

1 Kelly-Springfield 10-ton tandem, in A1 condition; will make very low price for cash.—JOHN MURTLAND, 209 N. Arkansas Ave., Atlantic City, N. J.

10-ton tandem Universal, A1 condition, sell ¼ cost.-HARPER

[Wanted]

8-ton paving roller at a bargain. Send information to M. 568, Engineering News.

SEWER PLANTS

2—Complete Sewer Contractor's Plants, including compressors and locks.—LINES FLYNN.

STEAM SHOVELS

Ohio Traction Steam Shovel. 1¼ yds. capacity; Cheap.—PEACE BROTHERS, 20 Main St., Flushing, N. Y.

Marion, model 60, steam shovel.—SOUTHERN.

1 ¾-yd. revolving traction, rebuilt.—LINES FLYNN.

1 70-ton Bucyrus, 2½ yd. dipper.—BRADEN.

1—Marion Osgood 16, Revolving, Traction—SCHMIDT.

1 95-C Bucyrus, 3½ yd. dipper.—MACGOVERN.

Type "O" Thew traction, modern, high number.—DALLETT.

One ¾ yd. Thew steam shovel; Price $2400.—WHITNEY.

1 Marion Model 20 1¼ yd. dipper—1 Marion Model 40—1½ yd. dipper; 1 Vulcan Little Giant 1¼ yd. dipper.—WEMLINGER.

1—"O" Thew, ⅝ yd. built 1912, A.1.—GIVIN.

2—Model 41 Marion, 1½ yd. high shop numbers.—GIVIN.

TANKS AND TOWERS

A concrete tower 90' high with 300 ft. of Insley chute; elevating bucket and hopper.—GLAZEBROOK.

TRACTION ENGINES

1 Buffalo Pitts 22 H.P. hauling engine.—SPROUL.

TRAVELING CRANES

1 15-ton electric 36' 6" span.—DOUGLAS.

TURBINES

2 Houston 44" Vertical, with beveled gears, shafting, etc.—WATER & LIGHT COMMISSION, Fergus Falls, Minn.

VULCANIZERS

Twelve Vulcanizers, various sizes.—WHITNEY.

WAGONS

5 Buffalo Pitts 6 yd. spreading wagons.—SPROUL.

For Sale or Rent
Compressors

1—22 x 22—13½ x 24 Sullivan, steam driven, class WB 2, straight line, 2 stage, capacity 1160 cu.ft.
1—24 x 24 x 30, McKiernan, class A, straight line, steam driven, capacity 1414 cu. ft.
1—24 x 24½ x 30, Ingersoll—class A, steam driven, straight line, capacity 1223 cu.ft.
2—16 x 20½ x 16, Ingersoll-Sargeant, class H-1, duplex, steam driven, capacity 1540 cu. ft.
2—65 Ton, Bucyrus steam shovels, 2½ yd. dippers (bargain).
2—Lidgerwood Hoisting engines, 14" x 18", D.C. three tandem drums, reversible and link motion, suitable for dredge, cableway or incline work.

A complete stock of hoisting engines, concrete mixers, derricks, pumps, boilers, etc., in fact, everything for the Contractor.

Henry A. Hitner's Sons Company
Philadelphia, Pa.

Use the Concrete Atomizer
to Tamp Mass Concrete

It fills all pockets and voids. It gives perfect adhesion to old work, without seams or cracks. It refaces old concrete, brickwork, masonry, wooden buildings or structural steel, and uses wet concrete instead of dry cement mortar.

Machines Sold or Rented

Harold P. Brown, 122 Liberty St., N. Y.

For Sale
Plant and Equipment

Including Locomotives, Gondolas, Derricks, Hoisting Engines, Boilers, Concrete Mixers, Rock Drills, Buckets, Pumps, Engines, Elevators, Conveyors, and Camp Equipment.

Alabama Power Company
Engineering Dept. **Birmingham, Alabama**

YOU CAN'T LOOK INTO THE EARTH

but we can get you a large clean core of all strata under your bridge or dam site to be examined in broad daylight. No guess work.

THE J. A. BRENNAN DRILLING CO.

Home Office— Scranton, Pa. Field Office— 30 Carson St., Pittsburgh, Pa.
Contractors for Diamond Drilling.

Your Idle Machinery

or plant, or tools for which you have no present use might be sold or rented to some other reader through the medium of a "For Sale or Rent" advertisement in ENGINEERING NEWS.

Rates on Application

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1 Standard Gauge Locomotive weight not to exceed 30 tons.
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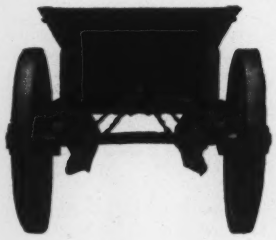

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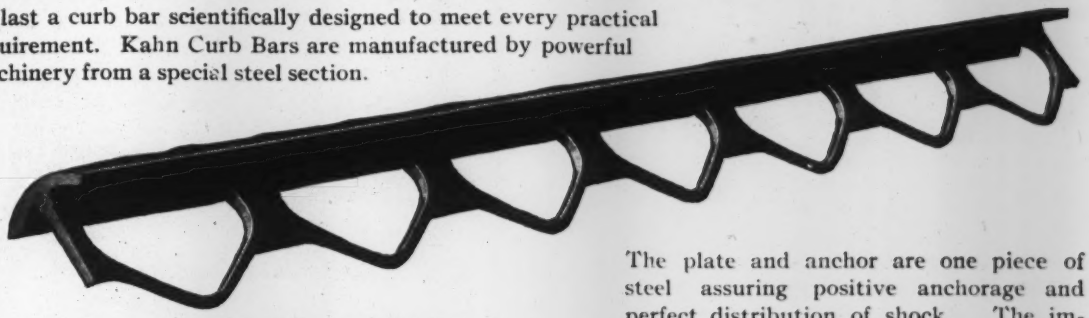

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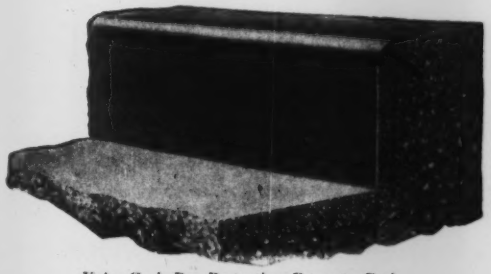

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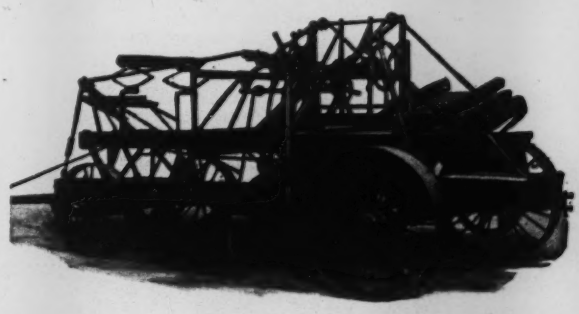

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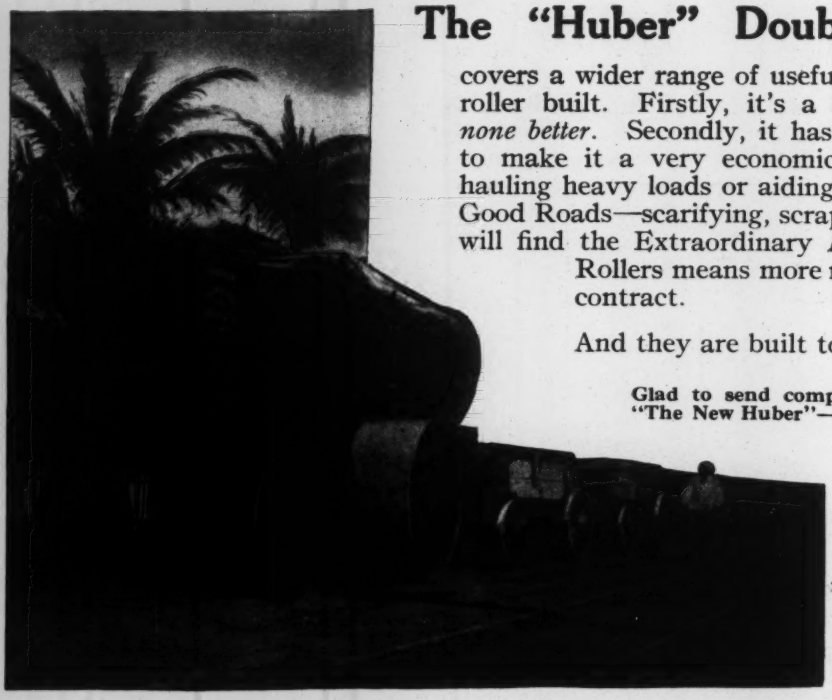

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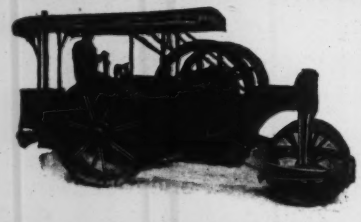

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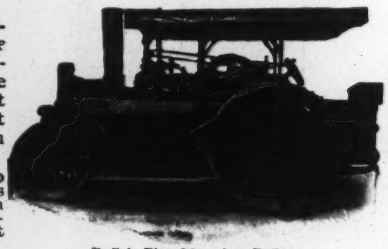

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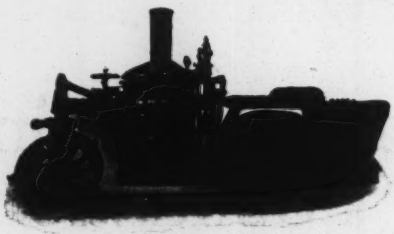

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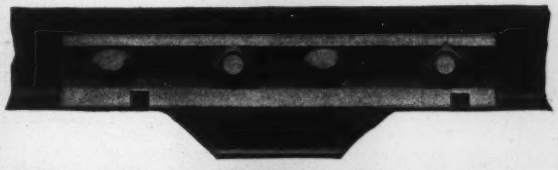

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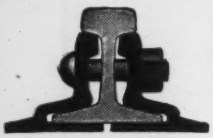

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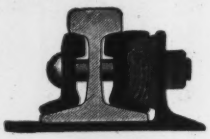

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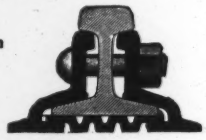

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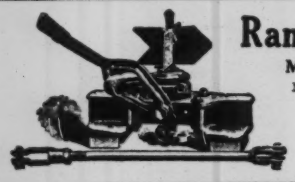

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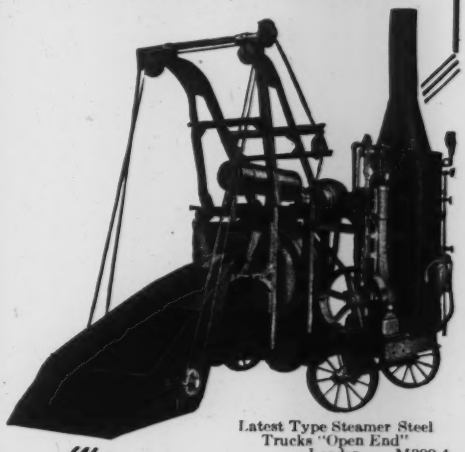

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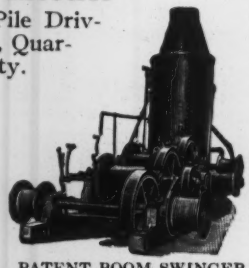
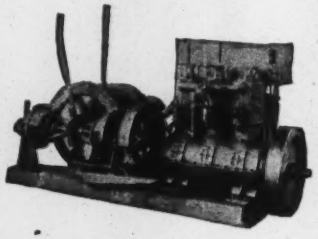


PATENT BOOM SWINGER
Simple and Efficient

For Hoisting Builder's Materials BUCKEYE HOISTS

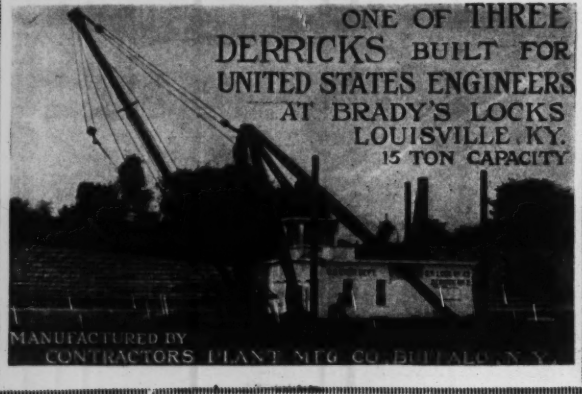


These builder's material or double cage hoists are unsurpassed in speed and durability. Equipped with either a single or three cylinder gasoline engine. The latter is something **entirely new** in contractor's hoists. Fitted with 2¼" shaft and 5" bearings; heavily babbitted. Frictions are positive and substantial. The reverse is worked with a clutch that can be thrown out of gear when using the capstan.

We also make the Buckeye Mortar Mixer, a machine that reduces the cost of laying brick.

Write for full particulars today.

Buckeye Engine & Foundry Co., Joliet, Illinois



For thirty years

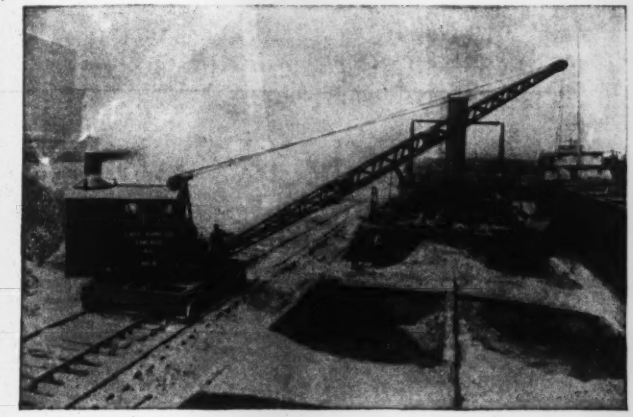
Byers Hoisting Engines

have given good service

The price they bring when sold after years of use and abuse, proves their high quality. You cannot afford to own a poor hoist. **Write for catalog.**

The John F. Byers Machine Co. Ravenna, Ohio

For Speed, Economy, and Durability Investigate the Merits of the "Ohio"



Four-Wheel Crane arranged for a 12-foot gauge of track used for unloading sand from barges

The sudden shocks, such as are incidental to locomotive crane service, cannot throw all the strain on a weak part of a Ohio Locomotive Crane.

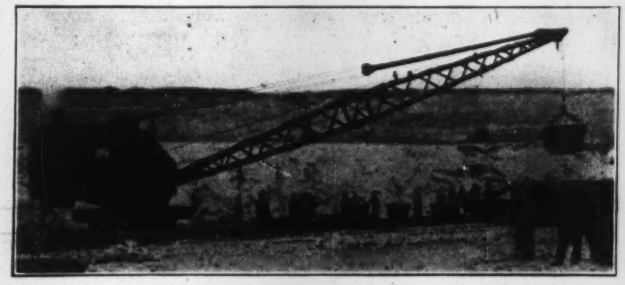
By making the base of one large steel casting and combining other parts into large steel castings instead of a number of small grey iron castings bolted together, we maintain a high degree of mechanical perfection which is not dependent upon the strength of small, weak members.

The accompanying illustration shows one of our cranes which handled **196,000** cubic yards of sand during the **1912** navigation season.

Made in various types from 5 tons to 50 tons capacity, for compressed air, steam or electric operation. Catalog No. 5?

THE OHIO LOCOMOTIVE CRANE CO.

MANSFIELD STREET BUCYRUS, OHIO



Solve that problem of keeping excavation costs at a profitable figure by using

Industrial Works Cranes

The conservative ratings and the reserve strength in these cranes mean the ability to stand up under severe day and night service. They are adapted to bucket digging and can be equipped with a steam shovel dipper arm. Our 1914 catalog No. 108 fully describes them. **Send for your copy.**

INDUSTRIAL WORKS, Bay City, Mich.

Locomotive and Wrecking Cranes, 5 to 150 tons capacity; Pile Drivers; Grab Buckets.

SALES AGENCIES: George M. Newhall Engineering Co., Philadelphia, Pittsburgh, and 50 Church St., New York.; J. G. Miller, St. Louis; Langford, Felts & Myers, San Francisco and Los Angeles; J. I. Blount & Co., Birmingham; F. H. Hopkins & Co., Montreal.

Traveling Cranes

For Power-House and every service. Electric and hand-power. Clearance diagrams and other information for initial layouts gladly furnished to engineers on request. Send for catalog.

We make Tainter Gate Hoists

Complete Foundry Plants WHITING FOUNDRY EQUIPMENT CO HARVEY-ILL U.S.A. **Cranes of All Kinds**

BROWNHOIST Locomotive Cranes

are built for hard and continuous service, — records showing that they will work day and night for months without one dollar's worth of repairs.

Send for catalogs I & K which show how and where these cranes are used.

The Brown Hoisting Machinery Co. Cleveland, Ohio

Note the Sheaves Fastened to the Arms—

This distributes the weight properly and exerts tremendous closing power. The closing power is exerted equally on both halves of shell.

The "Lakewood Digger" (Dowd's Patent) Digs Well Because—

It enters the material steadily and at equal pressure, giving a large load at each grab.

The placing of the sheaves is a radical departure from all other bucket construction.

Read about the "Why" in Catalog No. 15.

Lakewood Engineering Co. Dept. K. **Cleveland, O.**
New York Chicago Pittsburgh

LINK-BELT CRANES

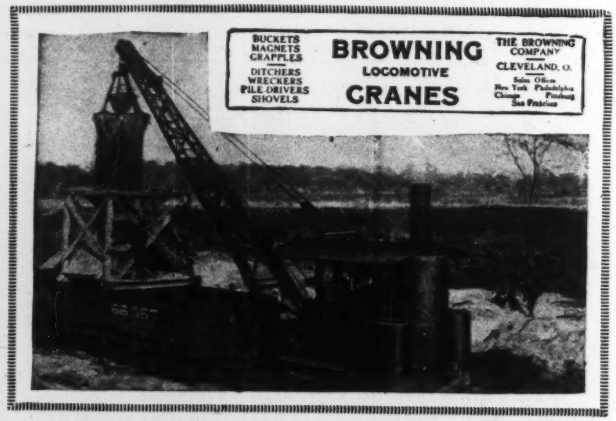
For Dependable Service

Steam or Electric

All Modern Attachments

Link-Belt Cranes are designed primarily for high speed grab bucket work—the hardest service to which locomotive cranes can be employed. Catalog on request.

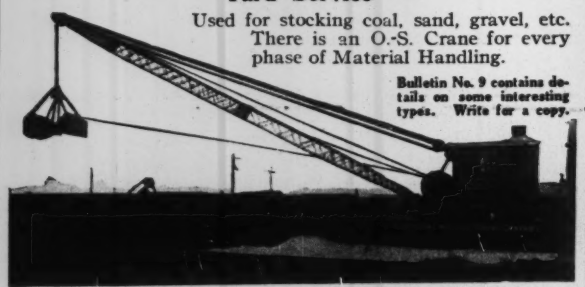
Link-Belt Company PHILADELPHIA, CHICAGO NEW YORK



O.-S. 25-Ton Radial Truck Crane for Profitable Yard Service

Used for stocking coal, sand, gravel, etc. There is an O.-S. Crane for every phase of Material Handling.

Bulletin No. 9 contains details on some interesting types. Write for a copy.



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Combine all the features the well-informed buyer looks for in a bucket. Bulletin "C" will convince you of the superiority of the "Brosius."

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Contracting Engineer
Pittsburgh, Pa.

PLAIN BUSHING made in halves

METALINE

(Trade Mark Reg.)

BUSHINGS for HOISTING SHEAVES

excel all other types for durability under heavy loads, and hard service.

OILLESS

THE METALINE COMPANY
Sole Manufacturers
6 West Ave. Long Island City, N.Y.

Strength

The tremendous strength and holding power of a Williams Bucket is illustrated by this photograph. After handling over half a million cubic yards of excavated material from the new Lexington Ave. Subway, New York City—with no repairs other than a single removal of the manganese steel jaw, this 3 cu-yd. Scraper Type

Williams Bucket

fully demonstrated its ability to continue its long service indefinitely by picking up this 7-ton rock at the Ravenswood, L. I, yard of the Bradley Construction Co.

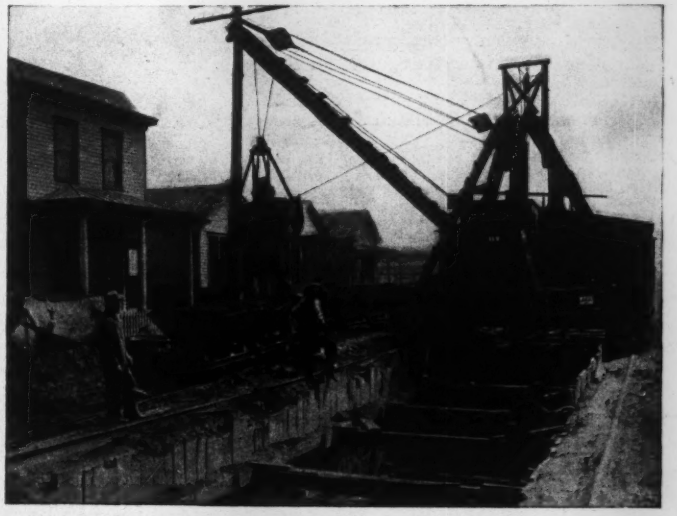
Mr. Joseph Poples, the master mechanic, is proud of his bucket and proves his full confidence in its holding power by standing almost under the rock.

If you have any special bucket problem, our engineers would be pleased to help you solve it.

Write today for the "Bucket Book."

The G. H. Williams Co.
1513-17 Rockefeller Bldg., Cleveland, Ohio

HAYWARD BUCKETS



Digging between cross bracing on a sewer contract with a Hayward Bucket

Are built in sizes to meet every need of the Engineer and Contractor from the DWARFS, which will operate inside of a 10-inch pipe, to the 10 cubic yard ORANGE PEEL and CLAM SHELLS.

There is a Hayward Bucket designed for handling every kind of material a bucket will dig. If our regular types will not do your work, we will build you a Special Bucket that will.

Catalogues and Pamphlets of Hayward Buckets and Digging Machinery sent upon request.

The Hayward Company, 50 Church St., New York

A "Union" Pile Hammer for Trestle Work

The project illustrated is in charge of W. J. Krome, Engineer for Florida East Coast Railway at Marathon, Florida.

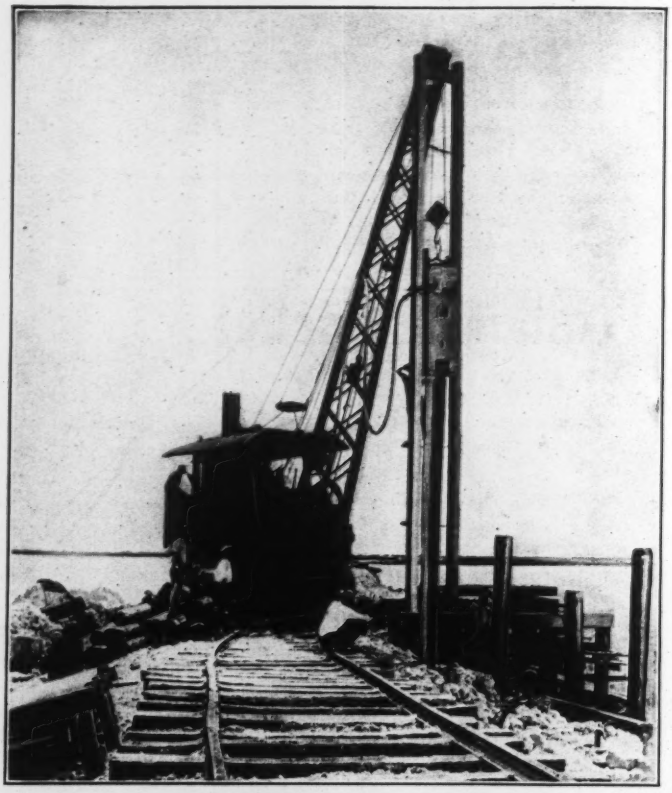
Here's an extract from his letter:

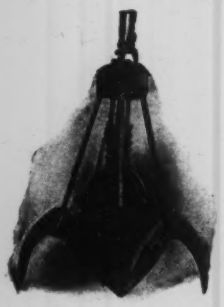
"We have used the Union Hammer in connection with our heaviest pile-driving work, and it has in every instance made a very creditable showing, in comparison with other types of steam and drop hammers which we have used. We have no hammer on any of our floating or track drivers that will put down a pile in hard driving more quickly, or with less damage to the pile, than the Union."

Let us send you our book on Pile Hammers which describes hammers for every kind of driving.

Write today for a copy.

Union Iron Works
West Shore Station Hoboken, N. J.
Manufacturers of Excavating Machinery and Contractors' Equipment.





Single Closing Sheave Orange Peel Dredging and Excavating Bucket

The construction of this bucket is most substantial, being made of homogeneous steel plate of 60,000 pounds tensile strain. Bearings are steel bushed, removable and easily replaced.

The four blades which form the main body of bucket are made extra heavy, with the points reinforced and welded, insuring well-hardened points for penetration.

The lower casting on crosshead is made of cast steel, and likewise the top casting which receives the arms. The arms are made of heavy forged iron and steel bushed.

All sizes in stock for immediate shipment.

We build buckets of all types.

Theo. Smith & Sons Company
Jersey City, N. J. U. S. A.

IVERSON Drag Line Scraper Bucket

is a member of the line of

DOBBIE Derricks Hoists

Absolute Control of the bucket when dumping into cars is one of the distinctive advantages of the "Iverson."

Will you write for further particulars?

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Sewer, Water and Gas Main Trenches
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FULL CIRCLE SWING · THEW · HORIZONTAL CROWDING MOTION · STEAM SHOVELS

One Day's Work—300 Wagons in a 3-foot Cut

We give definite figures on a job done with a Thew Shovel working in a 12" ledge of limestone and hard shale, operating on a nine per cent. grade in a 3-foot cut.

You are a contractor. How does a steady capacity of 300 wagons a day under the conditions described above appeal to you as a money-saving investment?

Power for the crowding motion is applied horizontally, enabling the working of very shallow cuts and furnishing a prying motion which will tear up anything except solid rock.

Describe the kind of shovel work you are doing and we'll tell you what Thew Shovel to use.

Write for the Thew Catalog today.

The Thew Automatic Shovel Company, Lorain, Ohio

Wherever you can profitably use a steam shovel, a MARION should be installed

We have never claimed that a **Marion** was the cheapest—in first cost, but we **know** that it can show the contractor more digging for every dollar spent—and at a lower upkeep—than any other make. And here's another point—a **Marion** is designed for constant service, for heavy service, for the peak load.

The **Marion** is the product of 30 years' experience—the output of a plant covering 75 acres. It is not enough for us to know that we have the best in materials and workmanship—we make chemical and physical tests of our parts and then we test the shovel as a whole under its own steam. We know what it means to have **Marion** signify "best." Why not write for our Catalog 54, **Today?**

Marion Steam Shovel Company

(Established 1884)

Station M Marion, Ohio U. S. A.

New York Office—50 Church St.

Avoid Risk—Use "Keystone"

Specify "Keystone" Explosives and eliminate the element of failure from your blasting operations.

"Keystone Powder" is merely a more pointed way of saying—blasting satisfaction.

And don't attribute these statements solely to the enthusiasm of its makers—"Keystone" has *proven* its dependability.

Evidence? We have lots of it, and handy, too. It's contained in the "Keystone" Booklet, sent for the asking.

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Keystone National Powder Co., Emporium, Pa.

Hydraulic Dredges?

We build them. One by us at Panama has pumped coral, sand and rock through 7200 ft. of pipe without relay. Dredges like that mean profit to you. **Write us today for details.**

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Simple methods—known costs—explained in new special circular—get it. Avenarius Carbolineum prevents decay of wood. Doubles life of timber. Costs 1/2 to 2c. per sq. ft.—$5 to $12 per 1000 ft. B. M. Applied by brush, spray or open tank. 37 years' continuous service. Depots everywhere.

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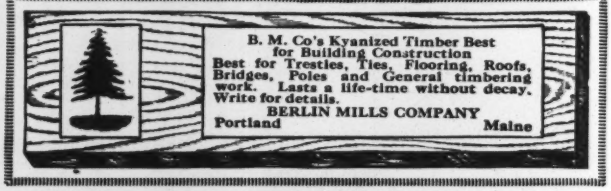
Capacity 100 million feet board measure annually.

Plants at New Orleans, La., and Louisville, Miss.



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Best for Trestles, Ties, Flooring, Roofs, Bridges, Poles and General timbering work. Lasts a life-time without decay. Write for details.
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were used, because the known qualities of this cement convinced the engineers of its peculiar fitness for engineering works of importance.

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See Page 152-153 in "Sweets" for Full Particulars

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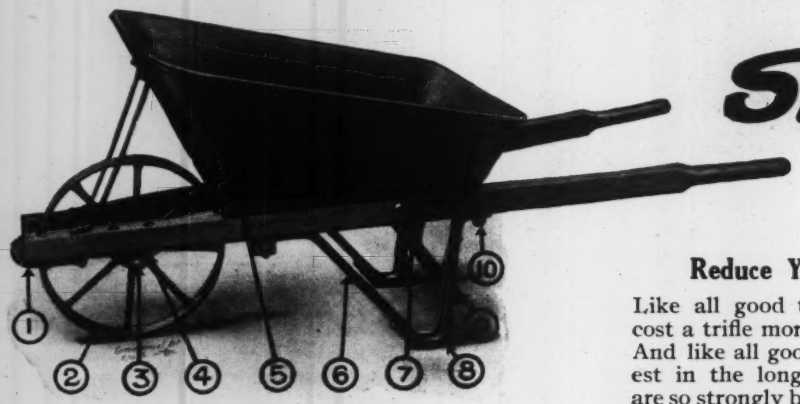

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Like all good things, Sterling Barrows cost a trifle more than ordinary barrows. And like all good things they are cheapest in the long run. Sterling Barrows are so strongly built that they will outlast two ordinary barrows. In this way they cut your barrow expense nearly in half. Catalog No. 19 shows the complete line.

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Water-proofs—Dust-proofs—Oil-proofs and Hardens concrete.

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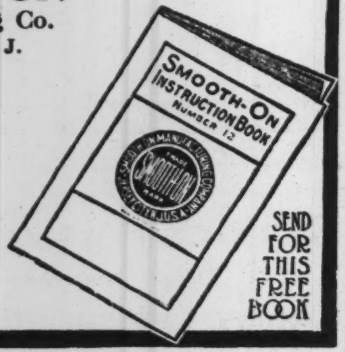

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Exhaustive tests covering 25 years prove this statement.

Ask about the proofs.

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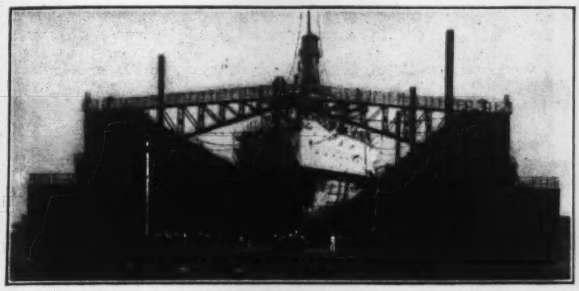

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(Stays Soft like White Lead)

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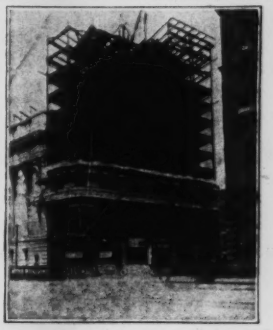

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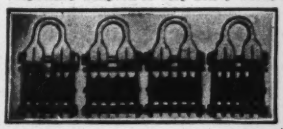

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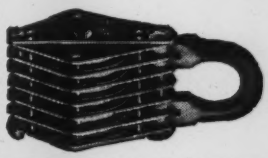

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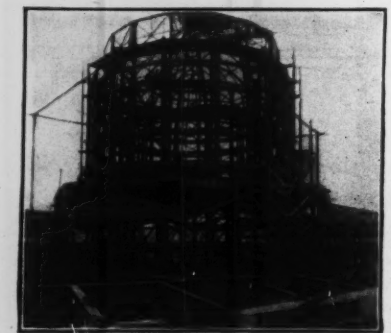

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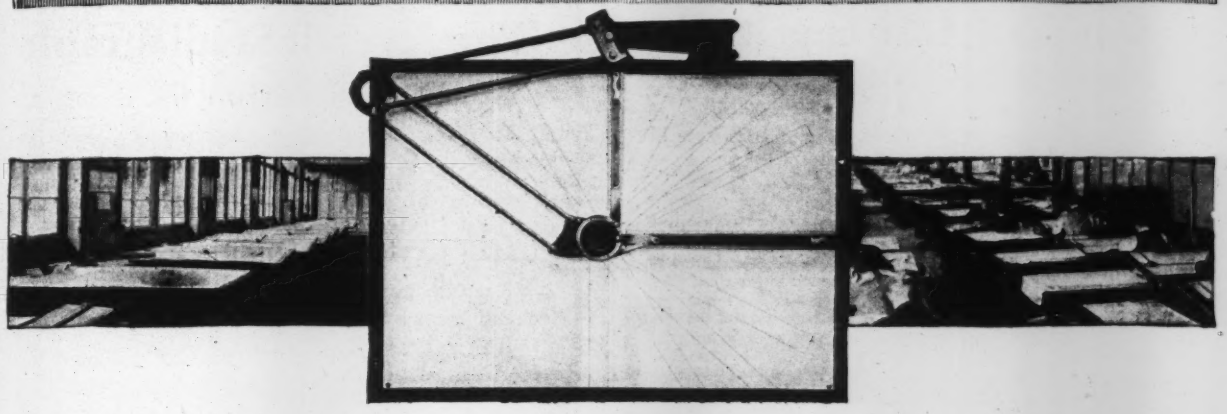

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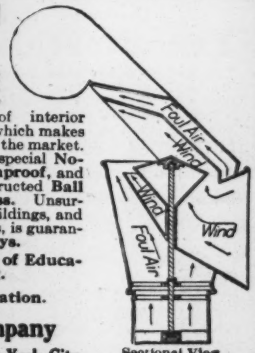

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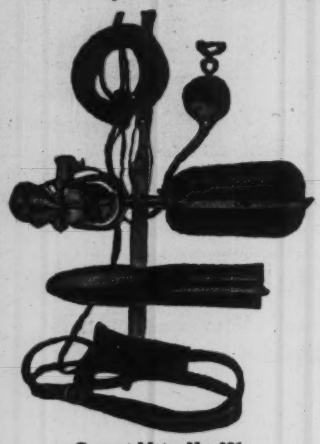

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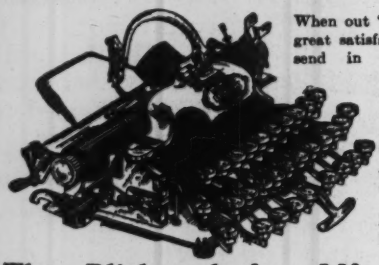

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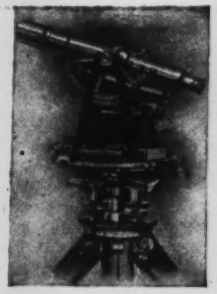

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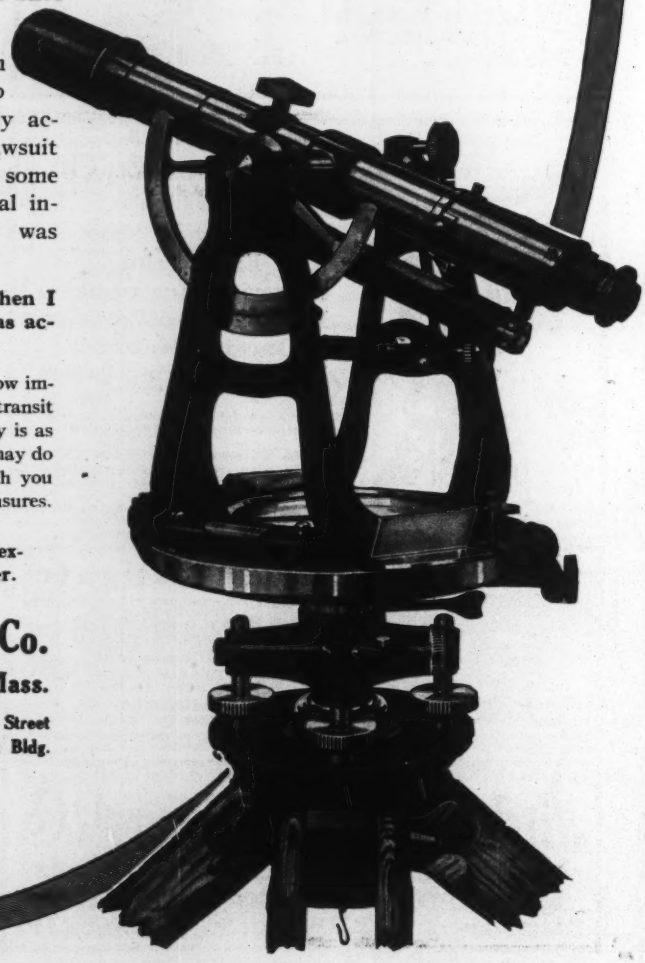

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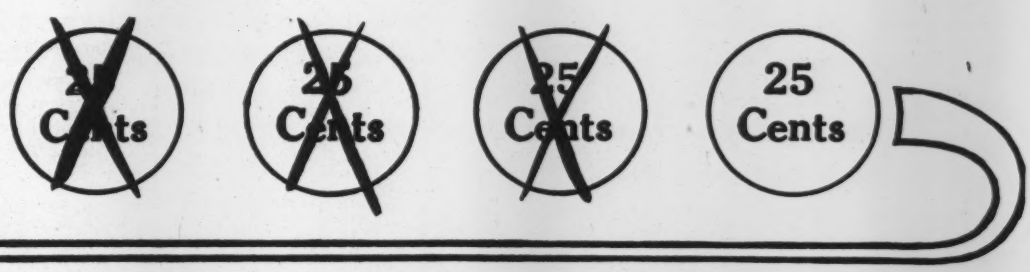

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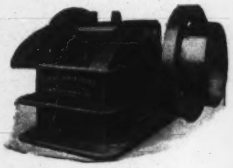

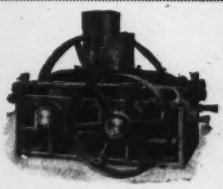

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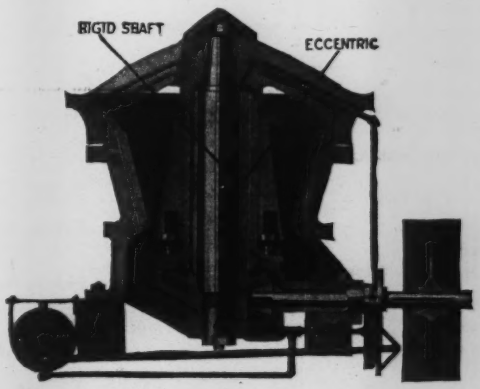

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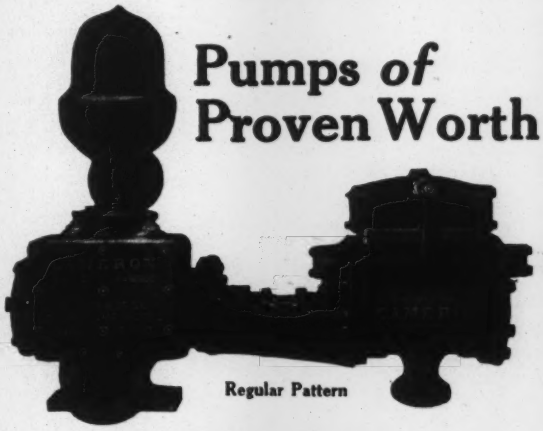

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All this is eliminated with Universal Pipe, so that the average cost of laying 12 inch Universal pipe is only 1.2 cents per foot, a saving of 11 cents over the old style bell and spigot pipe. All you need is a ratchet wrench.

U 98

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National Transit Co.

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American Well Works
Cameron Steam Pump Works, A. S.
De Laval Steam Turbine Co.
Lawrence Machine Co.
Morris Machine Works

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Cameron Steam Pump Works, A. S.
McGowan Co., John H.

Purifiers, Feed Water
New York Cont'l Jewell Filtration Co.
Norwood Engr. Co

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Carnegie Steel Co.

Rail-joints
Carnegie Steel Co.
Rail Joint Co., The

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Rivets
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Rolls, Crushing
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American Steel & Wire Co.

Rope, Wire
American Steel & Wire Co.
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Leschen & Sons Rope Co., A.

Rust-Resisting Metal
Inland Steel Co.

Sash, Steel
Trussed Concrete Steel Co.

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Acme Road Mchry. Co.
Buffalo Steam Roller Co.
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Screens, Well
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Hilmer's Sons Co., H. A.
Zelnicker Supply Co.,

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Harrison Safety Boiler Works

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Pacific Flush Tank Co.

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Inland Steel Co.

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Shovels
Wyoming Shovel Co.

Shovels, Steam
Browning Co., The
Marion Malleable Iron Works
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Thew Automatic Shovel Co.

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Republic Creosoting Co.
United States Wood Preserving Co.
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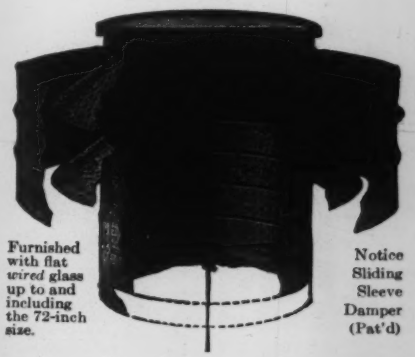
21 Burt Ventilators on the Arkansas State Capitol

The State Capitol at Arkansas is equipped with twenty-one Burt Ventilators to keep it free from impure air. If you knew the dimensions of this building, you'd appreciate the wonderful ventilating efficiency of Burt Ventilators and why so few are needed for the most severe service conditions.

Fresh air is the important thing in buildings of every kind—and especially in boiler and engine rooms.

Burt Ventilators are made strong, durable and storm-proof. Built with either metal or glass tops. The glass-top style combines the function of skylight with that of Ventilator. The damper can be opened or closed without obstructing the light. Burt Ventilators are always specified because of their great capacity and absolute reliability.



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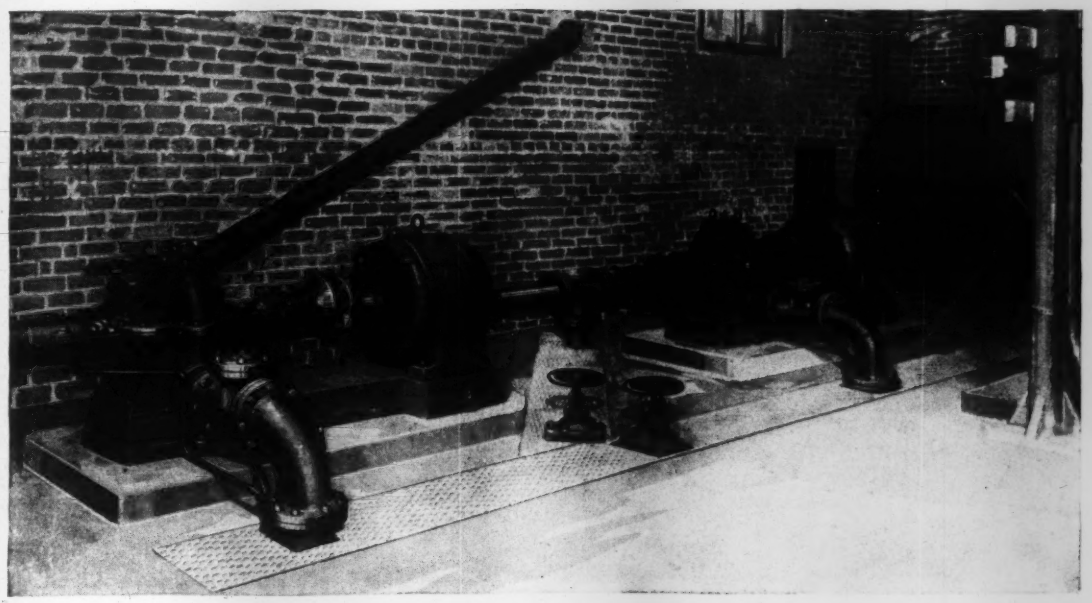


Meeting the Water Works Requirements of the Small Town

Here is an installation of "American" centrifugal pumps for supplying water for the Town of De Pue, Ill.

Water is taken from an 8-inch well located 25 feet from the side of the Town Hall and the entire waterworks, including pumps and pressure tank, is installed in space not otherwise used in the basement of the Town Hall.

Pumps are "American" Double Suction single stage type, direct connected to electric motors, each having a capacity of 300 gallons per minute.

Pumps are piped to operate separately, in parallel or in series. To afford greater floor space all piping, except the discharge pipes, is carried underneath the floor.

These pumps are working automatically with pressure type control into pressure tank of 3000 gallons capacity with a cut-out pressure of 50 pounds and a cut-in pressure of 40 pounds for domestic service with one pump working and the second unit held in reserve.

Pumps can be operated in parallel with a combined capacity of 600 gallons per minute against a 50 pound pressure if desired, or, by operating in series, they will deliver 300 gallons per minute against a pressure of 100 pounds with 29.5 feet suction lift. This is sufficient quantity for one 1-inch and one ⅞-inch nozzle and this pressure will throw water approximately 65 feet high from both nozzles.

When one pump is working automatically there is a quiescent period of about 20 minutes. To raise the pressure in the tank to 50 pounds, or from the automatic cut-in to the cut-out of the pump, requires about 4 minutes.

Features of this installation are the extreme suction lift, the utilization of space already available for the installation and the automatic operation requiring practically no attention.

This is only an illustration of how "American" centrifugal installations are designed for special conditions.

Bulletin 131 shows a large number of designs for waterworks installations. Catalog 132 illustrates and describes about 50 styles of "American" centrifugals. Write for them.

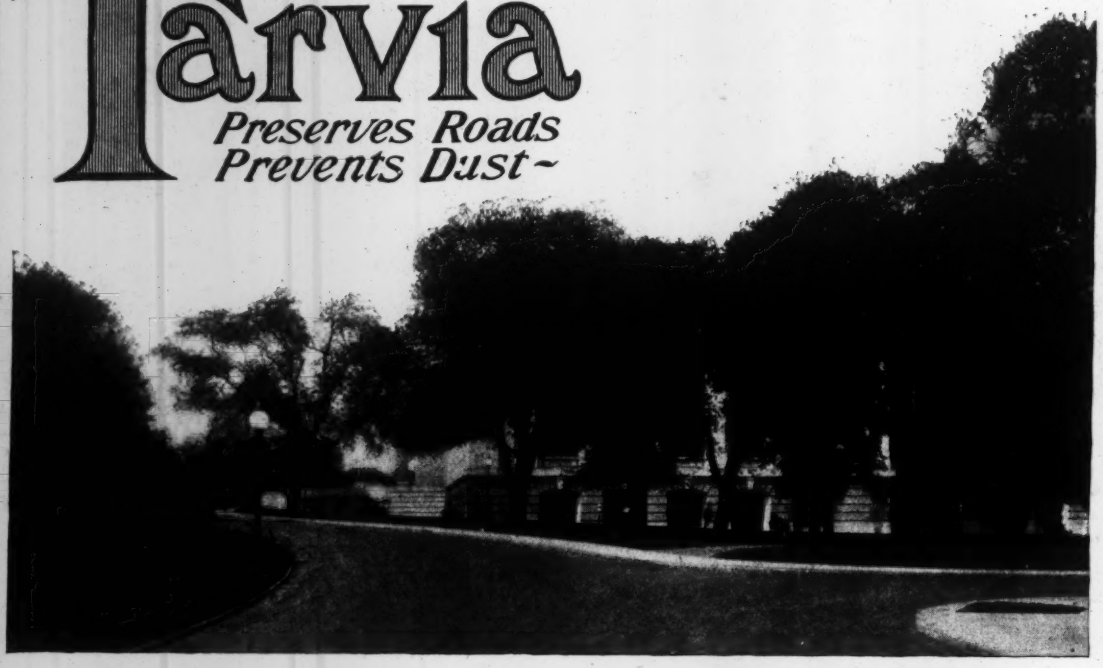
The American Well Works

General Office and Works, Aurora, Ill.

Chicago Office, First National Bank Building

Tarvia

Preserves Roads
Prevents Dust~



Roads around New National Museum, Washington, D. C. Constructed with "Tarvia X".

This road is three years old—

Here is a Tarvia-built road that for three years has carried the heavy traffic of sightseers to the New National Museum in Washington.

Ordinary macadam would have lasted but a few months in this location.

The addition of "Tarvia X" as a binder, when the road was constructed, has been sufficient to keep the surface in splendid condition for three years, with the prospect of very little maintenance expense in the near future.

Tarvia is a dense, viscid coal tar product of great bonding power. It introduces an element of plasticity in the roadway and binds the stone in a tough matrix. Internal friction under heavy loads is prevented. Water runs off the surface instantly, and the tarviated macadam will will not ravel on slopes. The surface is automobile-proof, producing no dust.

Tarviated macadam in the end costs no more than ordinary macadam—its first cost is a little higher, but its maintenance cost is very much lower.

Tarvia is made in three grades: "Tarvia X" is suitable for building Tarvia-macadam roads; "Tarvia A" and "Tarvia B" are thinner grades suitable for roads already in use, to preserve them and make them dustless.

Booklets free on request.

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